



Spoštovane članice in člani Slovenskega društva za biologijo rastlin!

Vabim vas na redno letno skupščino društva, ki bo v **petek, 26.3.2021, ob 10:00 virtualno** (<https://us02web.zoom.us/j/88105588591?pwd=eXVvbVcxVTFEMzIYWDJHbnQ3Wmp4dz09>).

Za skupščino je predviden naslednji **dnevni red**:

1. Izvolitev delovnega predsedstva
2. Poročilo o delovanju društva v letu 2020 in finančno poročilo za leto 2020
3. Program dela za leti 2021 in 2022
4. Članarina v letu 2021
5. Razno

V okviru skupščine bo tudi strokovno predavanje **dr. Eliane Caroline Bianucci** iz INIAB-CONICET (Argentina)/ Autonomus University of Barcelona (Španija) z naslovom »**Legume-bacteria interactions as a biotechnological tool to avoid crop grain contamination**«. Predavanje bo v angleščini. Povzetek predavanja in življenjepis predavateljice najdete v nadaljevanju.

Vljudno vabljeni!

dr. Špela Baebler, predsednica



V Ljubljani, 17.3.2021



LEGUME-BACTERIA INTERACTIONS AS A BIOTECHNOLOGICAL TOOL TO AVOID CROP GRAIN CONTAMINATION

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Peanut, also known as groundnut, is considered the 13th most important food crop in the world and Argentina is top peanut exporting countries followed by India and the USA. This legume engages in a symbiotic interaction with rhizobia, resulting in the formation of specialized root nodules where fixation of atmospheric nitrogen (N) takes place. Approximately 90% of the Argentinian production of peanut is located in Córdoba province, where 90% of the groundwater of the region is contaminated with arsenic (As). This is a harmful metalloid that can be naturally present in soil and groundwater. The latter is the most common source of human poisoning with As. Furthermore, ingestion of As-contaminated food is currently receiving much attention, since crops can take up the metalloid either from As-contaminated groundwater or from As-contaminated water used in artificial irrigation. Moreover, the increased occurrence of flooding episodes has aggravated the situation since groundwater could easily reach rhizosphere level. This issue constitutes not only an agronomic problem through negative effects on grain quality and yield, but also a serious risk for human health.

Some peanut seeds, harvested from areas where groundwater was close to the rhizosphere, As concentration exceeded the maximum allowed limit (0.1 mg As kg⁻¹) set by the Codex Alimentarius Commission. Therefore, the aim of our work is to evaluate effect of As on peanut plants at biochemical and morpho-physiological level in order to find strategies to avoid seed contamination. One of the first studies carried out in our laboratory to decrease As concentration in plants was to identify peanut microsymbiont exhibiting strongest reduction of As mobility in peanut. Results indicated *Bradyrhizobium* sp. SEMIA6144 was the rhizobia that reduced As translocation to shoots by improving metalloid phytostabilization in roots and nodules best in comparison to other species tested. However, peanut growth, nodulation and N content were significantly reduced. In addition, it is known that arsenate is a chemical analogue of phosphate (P), and its cellular uptake is mediated by phosphate transporters. For that, we inoculated peanut with native solubilizing phosphate bacteria (PSB) and the rhizobia. PSB acted as a helper microorganism to rhizobia by increasing P and N content and therefore, improving peanut growth under this unfavourable growth condition. Field experiments are being carried out to further elucidate the effect of As on peanut crop.



PERSONAL INFORMATION

NAME: Bianucci, Eliana Carolina.
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EDUCATION AND TRAINING

POSTGRADE: **Dr. in Biological Science.** National University of Río Cuarto. Title of the thesis: Effects of cadmium in the symbiotic interaction peanut-rhizobia: biochemical and physiochemical mechanisms implicated on stress tolerance". March 2012.

UNIVERSITARY: **Microbiologist.** National University of Río Cuarto. October 2006.

ACTUAL POSITION

- o Member of the research career of the National Council of Scientific and Technical Research (CONICET) in Agrobiotechnological Research Institute (INIAB-CONICET) at the National University of Río Cuarto. Research line: "Impact of abiotic stresses in interaction peanut-rhizobia-plant growth-promoting bacteria" since 2014.
- o Assistant professor at the National University of Río Cuarto since 2015.

RESEARCH INTEREST

In the area of agricultural sciences, evaluation of nodulation and growth at physiological, biochemical and molecular level in response to abiotic stresses in the symbiotic association peanut-*Bradyrhizobium* sp. The research labor is focused on elucidate the oxidative and antioxidant response of peanut under arsenic (As) stress aggravated by flooded conditions. Also, the use of plant growth-promoting bacteria (PGPB) as a strategy to improve peanut growth under unfavorable growth conditions.

JOURNAL ARTICLES

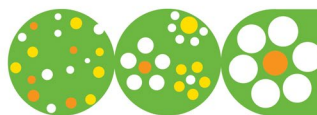
- 1) Peralta JM, Travaglia C, Romero-Pertas MC, Furlan A, Castro S, **Bianucci E.** 2020. Unraveling the impact of arsenic on the redox response of peanut plants inoculated with two different *Bradyrhizobium* sp. strains. *Chemosphere*, 259: 127410 doi.org/10.1016/j.chemosphere.2020.127410
- 2) Furlan AL, **Bianucci E,** Giordano W, Castro S, Becker D. **2020.** Proline metabolic dynamics and implication in drought tolerance in peanut plants. *Plant physiology and biochemistry, Plant Physiology and Biochemistry*, 151: 566-578. DOI:10.1016/j.plaphy.2020.04.010
- 3) Ludueña LM, **Bianucci E,** Anzuay MS, Angelini JG, Fabra A, Taurian T. **2020.** First insights into the role of PQQ cofactor in the modulation of bacterial redox state and in the early interaction with peanut (*Arachis hypogaea* L.). *Applied Soil Ecology*, 152: 103560. DOI:10.1016/j.apsoil.2020.103560
- 4) **Bianucci E,** Furlan A, Hernández LE, Castro S. **2019.** Insights into the impact of a natural arsenate dose on growth, nodulation and the redox metabolism of soybean plants. *Pedosphere*, 29(4): 527–533. DOI:10.1016/S1002-0160(19)60816-7
- 5) **Bianucci E,** Godoy A, Furlan A, Peralta JM, Hernández LE, Carpena-Ruiz RO, Castro S. **2018.** Arsenic toxicity in soybean alleviated by a symbiotic species of *Bradyrhizobium*. *Symbiosis*, 74:167-176. DOI:10.1007/s13199-017-0499-y
- 6) **Bianucci E,** Furlan A, Tordable MC, Hernández LE, Carpena-Ruiz RO, Castro S. **2017.** Antioxidant responses of peanut roots exposed to realistic groundwater doses of arsenate: identification of glutathione S-transferase as a suitable biomarker for metalloid toxicity. *Chemosphere*, 181:551-561. DOI:10.1016/j.chemosphere.2017.04.104
- 7) Furlan A, **Bianucci E,** Castro S, Dietz KJ. **2017.** Metabolic features involved in drought stress tolerance mechanisms in peanut nodules and their contribution to biological nitrogen fixation. *Plant Science* 263:12-22. DOI:10.1016/j.plantsci.2017.06.009
- 8) Furlan A, **Bianucci E,** Tordable MC, Kleinert A, Valentine A, Castro S. **2016.** Dynamic responses of photosynthesis and antioxidant system during a drought and rehydration cycle in peanut plants. *Functional Plant Biology*, 43(4) 337-345. DOI:10.1071/FP15206



- 9) Furlan A, **Bianucci E**, Tordable MC, Castro S, Dietz KJ. **2014**. Antioxidant enzyme activities and gene expression patterns in peanut nodules during a drought and rehydration cycle. *Functional Plant Biology*. 41: 704–713. DOI:10.1071/FP13311
- 10) **Bianucci E**, Furlan A, Rivadeneira J, Sobrino-Plata J, Carpena-Ruiz R.O, Tordable M.C, Fabra A, Hernández L.E, Castro S. **2013**. Influence of cadmium on the symbiotic interaction established between peanut (*Arachis hypogaea* L.) and sensitive or tolerant bradyrhizobial strains. *Journal of Environmental Management*, 130:126-134. DOI:10.1016/j.jenvman.2013.08.056
- 11) **Bianucci E**, Fullana C, Furlan A, Castro S. **2013**. Antioxidant defense system responses and role of nitrate reductase in the redox balance maintenance in *Bradyrhizobium japonicum* strains exposed to cadmium. *Enzyme and Microbial Technology*. 53:345–350. DOI:10.1016/j.enzmictec.2013.07.007
- 12) **Bianucci E**, Sobrino-Plata J, Carpena-Ruiz RO, Tordable MC, Fabra A, Hernández LE, Castro S. **2012**. Contribution of phytochelatins to cadmium tolerance in peanut plants. *Metallomics*, 4:1119-1124. DOI:10.1039/C2MT20146A
- 13) **Bianucci E**, Fabra A, Castro S. **2012**. Involvement of glutathione and enzymatic defense system against cadmium toxicity in Bradyrhizobium sp. strains (peanut symbionts). *Biometals*, 25(1):23-32. DOI:10.1007/s10534-011-9480-z
- 14) **Bianucci E**, Fabra A, Castro S. **2011**. Cadmium accumulation and tolerance in *Bradyrhizobium* spp. (peanut microsymbionts). *Current Microbiology* 62: 96-100. DOI: 10.1007/s00284-010-9675-5
- 15) Fabra A, Castro S, Taurian T, Angelini J, Ibañez F, Dardanelli M, Tonelli M, **Bianucci E**, Valetti L. **2010** Interaction among *Arachis hypogaea* L. (peanut) and beneficial soil microorganisms: how much is it known?. *Critical Reviews in Microbiology*, 36: 179–194. DOI: 10.3109/10408410903584863
- 16) **Bianucci E**, Fabra A, Castro S. **2008**. Growth of *Bradyrhizobium* sp. SEMIA 6144 in response to Methylglyoxal: Role of Glutathione. *Current Microbiology* 56: 371-375. DOI: 10.1007/s00284-007-9090-8
- 17) **Bianucci E**, Tordable MC, Fabra A, Castro S. **2008**. Importance of glutathione in the nodulation process of peanut (*Arachis hypogaea* L.). *Physiologia Plantarum* 134: 342-347. DOI:10.1111/j.1399-3054.2008.01126.x

CHAPTER IN BOOKS

- 1) Furlan A, **Bianucci E**, Llanes A, Peralta JM, Castro S. **2020**. "Abiotic stress tolerance including salt stress, drought stress and other stresses". In: "Legume Agriculture and Biotechnology". Guleria, P., Kumar, V., Lichtfouse, E. (Eds.). *Sustainable Agriculture Reviews (SAR)* <http://www.springer.com/series/8380>. In press.
- 2) **Bianucci E**, Peralta M, Furlan A, Hernández LE, Castro S. **2020**. "Arsenic in wheat, maize and other crops". In: "Arsenic in Drinking Water and Food". Srivastava, S. (Ed). Ed. Springer. 460 pp. pp. 279-306. ISBN: 978-981-13-8587-2.
- 3) Peralta JM, Travaglia C., Gil R, Furlan A, Castro S, **Bianucci E**. **2019**. An effective rhizoinoculation restrains arsenic translocation in peanut and maize plants exposed to a realistic groundwater metalloid dose. In: *Environmental Arsenic in a Changing World*. Zhu, Guo, Bhattacharya, Ahmad, Bundschuh & Naidu (Eds). 714 pp, pp 283-286. ISBN 9781351046633. <https://doi.org/10.1201/9781351046633>
- 4) Furlan A, **Bianucci E**, Sequeira M, Álvarez L, Peralta JM, Valente C, Guarnieri V, Castro S. **2019**. "Combined Application of Microbial and Non-Microbial Biostimulants to Improve Growth of Peanut Plants Exposed to Abiotic Stresses". In: *Microbial Probiotics for Agricultural Systems, Sustainability in Plant and Crop Protection* Gonzalez-Andres, F., Zuñiga, D., Ormeño, E. (Eds.) Ed. Springer. 256 pp. pp. 239-256. ISBN: 978-3-030-17596-2.
- 5) **Bianucci E**, Furlan A, Tordable MC, Fabra A, Hernández LE, Carpena-Ruiz R, Castro S. **2018**. Impacto del cadmio sobre la acumulación y la producción de granos en cultivos de maní. In: *Biorremediación de los recursos naturales*. Editorial INTA. pp. 367-385. ISBN: 978-987-521-911-3.
- 6) Angelini J, Taurian T, Ibañez F, Tonelli M, **Bianucci E**, Anzuay S, Valetti L, Furlán A, Muñoz V, Ludueña L, Carlier E, Castro S, Fabra A. **2017**. Bacterias asociadas a la planta de maní: Mecanismos y fisiología de la interacción. In: *El cultivo de maní en Córdoba (II Parte)*. Eds. Fernández E., Giayetto O. Editorial Universidad Nacional De Río Cuarto. pp. 135-159. ISBN 978-987-42-3736-1
- 7) **Bianucci E**, Furlan A, Castro S. **2017**. Importance of glutathione in the legume-rhizobia symbiosis. In: *Glutathione in plant growth, development and stress tolerance*. Eds. Hossain M.A., Mostafa M.G., Días Vivancos P., Burritt D.J., Fujita M., Tran L-S.P. Editorial Springer. Pp 373-393. ISBN 978-3-319-66682-2. DOI:10.1007/978-3-319-66682-2
- 8) Furlan A, **Bianucci E**, Castro S. **2016**. Signaling role of ROS in modulating drought stress tolerance. In: *Drought Tolerance in Plants, Vol. 1: Physiology and Biochemistry*. Eds. Hossain, M.A., Wani, S.H., Bhattachajee, S., Burritt, D.J., Tran, L.-S.P. Editorial Springer. pp 309-330. ISBN 978-3-319-28897-0. DOI: 10.1007/978-3-319-28899-4



9) Castro S, **Bianucci E**, Rivadeneira J, Tordable MC, Fabra A, Sobrino-Plata J, Hernández L, Carpena-Ruiz R. **2013**. Accumulation and tolerance to heavy metal cadmium in free-living rhizobia and in symbiosis with legumes. In: Rizosfera, biodiversidad y agricultura sustentable. Editorial Asociación Argentina de Microbiología, páginas 303-320, ISBN 978-987-26716-1-7.

Nine published abstract

INTERNSHIPS ABROAD

- 1) Laboratory of Professor Dr. Charlotte Poschenrieder, Autonomous University of Barcelona, "impact of As on peanut growth aggravated by flooding conditions". 2019-currently.
- 2) Laboratory of Dr. Alexander J. Valentine, University of Stellenbosch, South Africa. MINCYT-DST grant. March 2015.
- 3) Laboratory of Dr. Ramón Carpena and Dr. Luis E. Hernandez, Autonomous University of Madrid. Caroline Foundation grant. December 2009.

AWARDS

1. Two special mention for two posters presented on "IV Reunión Conjunta de Sociedades de Biología de la República Argentina". September 2020. Argentina
2. Honor diploma, third place in Basic Research for the presentation of a poster in "III Conferencia Iberoamericana De Interacciones Beneficiosas Planta – Microorganismo – Medio Ambiente (IBEMPA)". November 2017. Perú
3. Award of the X edition of the National Contest of Innovations -INNOVAR 2014 in the category Innovation at the University. November 2014. Argentina
4. Award in the Biotechnology Area at the 5th edition of the "Microbiologist Week" congress. October 2005. Argentina

DIRECTION OF RESEARCH PROJECTS

- 1) Development of biotechnological strategies to limit arsenic accumulation and translocation in peanut plant. Agencia Nacional De Promoción Científica Y Tecnológica (PICT). PICT-03774-2019. 2021-2024.
- 2) Effect of arsenic on the bean (*Phaseolus vulgaris* L.) - rhizobia interaction: biochemical and physiological mechanisms involved in the defense strategy of the plant. SECyT-National University of Villa Mercedes (R. N°000587/2016). 2016-2019.
- 3) Impact of arsenic on peanut-rhizobia interaction: implication of metalloid-tolerant rhizobia inoculation in the accumulation and yield production. Agencia Nacional De Promoción Científica Y Tecnológica (PICT). PICT-0956-2014. 2015-2018.

MEMBER OF 14 RESEARCH PROJECTS

GRADUATED SCHOLARSHIPS

- ✓ Postdoctoral scholarship (2 years) supported by CONICET in the theme "Impact of arsenic on the oxidative and antioxidant response of peanut plants. Supervisors: Dr. Stella Castro and Dr. Ramón Carpena-Ruiz (Autonomous University of Madrid). 2012-2014.
- ✓ Internal Postgraduate Scholarship financed by CONICET and MINCYT-Córdoba on **(2 years) to finish the doctorate program**. Supervisors: Dr. Stella Castro and Adriana Fabra. 2010- 2012.
- ✓ Internal Postgraduate Scholarship financed by CONICET and MINCYT-Córdoba **(3 years) on "Studies on the rhizobia-peanut symbiotic association under cadmium exposure: role of GSH as a key antioxidant molecule"** Supervisors: Dr. Stella Castro and Adriana Fabra. 2007-2010.

TEACHING ACTIVITIES

1. As assistant professor of the course a) Biology for Microbiology, Biological Sciences and Laboratory Technician careers b) Molecular Biology (code 2100) c) Introduction to Biology (code 3100). 2015-currently. National University of Río Cuarto.
2. As assistant professor in the National University of Villa Mercedes. Courses: a) Microbiology, Parasitology and Immunology, b) Biological Chemistry of the careers of Nursing and Midwifery, Kinesiology and Physiatry. Year 2013.



3. As undergraduate in the Department of Natural Sciences. Faculty of Exact, Physical-Chemical and Natural Sciences. National University of Río Cuarto. Course General Biology (code 2100) of the careers of Microbiology, Biology and Laboratory Technician. Years: 2007-2013.

Postgraduate teaching activities:

- 1) Assistant professor in four courses, National University of Río Cuarto.
- 2) Assistant professor in two seminars, National University of Río Cuarto.
- 3) Participation as a guest teacher in the Biotechnology Master. Autonomous University of Madrid.

PARTICIPATION IN TEACHING PROJECTS

PELPA 2016. "Preparation of practical work reports in Biology: the challenge of written communication". Faculty of Exact, Physical-Chemical and Natural Sciences, National University of Río Cuarto (Res. Rec. N° 716/16).

Book chapter derived from the project

Authors: Analía Príncipe, Fernando Ibañez, María L. Tonelli, María S. Anzuay, **Eliana C. Bianucci**, et al. "Los informes en Biología: el desafío de la comunicación". En: Creer, crear y crecer con experiencias pedagógicas innovadoras. Ana Vogliotti, María Luisa Ledesma, Carolina Isabel Roldan y Jimena Vanina Clerici (Coordinators). ISBN/ISSN: 978-987-688-344-3. Editorial: UniRío 125-137 pp. National University of Río Cuarto.

TRAINING OF HUMAN RESOURCES

Graduate fellows: Supervision of 3 Master. Autonomous University of Barcelona; Supervision of 1 Doctoral Thesis in Biological Sciences National University of Río Cuarto.

Undergraduate supervision of 5 final degree theses

Supervision of 8 undergraduate fellows

Supervision of 2 research internships

Tutor of 7 undergraduate research practices

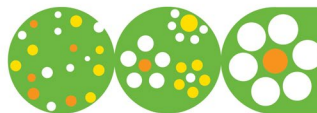
CONFERENCES AND WORKSHOPS

PARTICIPATION IN 17 NATIONAL CONGRESSES (ARGENTINA)

INTERNATIONAL

- 1) Peralta JM, Travaglia C, Gil R, Furlan A, Castro S, **Bianucci E.** An effective rhizoinoculation restraints arsenic translocation in peanut and maize plants exposed to a realistic groundwater metalloid dose. 2-4-21_20136. 7th International Congress And Exhibition: Arsenic In The Environment. Environmental Arsenic in a Changing World As2018. Abstract book, 2-4-21-20136. Beijing, P.R. China, 1-6 July, **2018**.
- 2) **Bianucci E,** Peralta JM, Furlan A, Travaglia C, Castro S. An effective peanut-*Bradyrhizobium* sp. symbiotic interaction restraints arsenic translocation in plants. III Conferencia Iberoamericana De Interacciones Beneficiosas Planta – Microorganismo – Medio Ambiente (IBEMPA). Lima, Perú. 6 -10 November **2017**.
- 3) Furlan A, **Bianucci E,** Sequeira M, Giordano W, Castro S. Strategy to improve peanut development by application of biostimulant and inoculant under drought stress. III Conferencia Iberoamericana De Interacciones Beneficiosas Planta – Microorganismo – Medio Ambiente (IBEMPA). Lima, Perú. 6 - 10 de November **2017**.
- 4) Furlan A, **Bianucci E,** Valentine A, Castro S. "Recovery of photosynthetic activity and biological nitrogen fixation in the peanut-*Bradyrhizobium* sp. Interaction. exposed to water stress and rehydration". XV Congreso Latinoamericano XXX Reunión Argentina de Fisiología Vegetal. Abstract book page 55. Mar del Plata, Argentina. 21 - 24 September **2014**.
- 5) **Bianucci E,** Tordable M C, Fabra A Sobrino-Plata J, Hernández LE, Carpena R, Castro S. "Influencia del cadmio sobre la interacción simbiótica *Bradyrhizobium* sp.-maní". XXV Reunión Latinoamericana de Rizobiología (RELAR). Abstract book page, AT7-010. Piriápolis, Maldonado, Uruguay. 4 - 9 September **2011**.
- 6) Sobrevals L, **Bianucci E,** Fabra A, Castro S. "Assessment of the Role of Glutathione in the Growth of *Bradyrhizobium* sp. (peanut symbiont) under Environmental Stress". XVII Congreso Latinoamericano de Microbiología. X Congreso Argentino de Microbiología. Abstract book. Buenos Aires, Argentina. 17 - 21 October **2004**.

SPEAKER AT INTERNATIONAL WORKSHOP



“Bioavailability and toxicity of the heavy metal cadmium in the peanut-rhizobia symbiotic association”. First International Bioremediation Workshop (PRITIBIO) ISBN: 978-987-29338-8-3. Universidad de Buenos Aires. October 2013.

MANAGEMENT ACTIVITIES

Member of the spaces commission of the Department of Natural Sciences. National University of Río Cuarto. 2018 (Departamental Resolution 011/18).

SCIENTIFIC DISCLOSURE

Magazine & Newspaper articles

Agencia CTyS, Ciencia, tecnología y Sociedad. “Un biofertilizante que resiste metales pesados y sequía”.

<http://www.ctys.com.ar/index.php?idPage=20&idArticulo=3048>

El Digital 1. “Un biofertilizante que resiste metales pesados y sequía”

<http://www.el1digital.com.ar/articulo/view/49799/un-biofertilizante-que-resiste-metales-pesados-y-sequia>

Página inicial de la web Universidad Nacional De Río Cuarto; “Investigación realizada por docentes y becarios de la Facultad ganó el premio INNOVAR 2014” https://www.unrc.edu.ar/unrc/n_comp.cdc?nota=28876

Agromagazine. Tv, <https://www.agromagazine.tv/biofertilizante-que-resiste-metales-pesados-y-sequia/>

“Consecuencias del metal pesado cadmio en cultivos de maní”

<http://www1.rionegro.com.ar/blogs/invisibles/prevencion/consecuencias-del-metal-pesado-cadmio-en-cultivos-de-mani/>

http://argentinainvestiga.edu.ar/noticia.php?titulo=consecuencias_del_metal_pesado_cadmio_en_cultivos_de_mani&id=1649

<https://inta.gob.ar/documentos/biodisponibilidad-y-toxicidad-del-metal-pesado-cadmio-en-la-asociacion-simbiotica-mani-rizobios>

<https://www.todoagro.com.ar/consecuencias-del-metal-pesado-cadmio-en-cultivos-de-mani/>

Youtube video:

“La presencia de cadmio en el suelo puede afectar el cultivo de maní”

<https://www.youtube.com/watch?v=cOPxT5FP2Hc>;

OTHERS

Evaluation of 2 Research and Development projects

Reviewer for journals

Acta Advances in Agricultural Sciences, Editorial AAAS.

Acta Physiologiae Plantarum, Editorial Springer.

Archives of Microbiology, Editorial Springer.

Arid Land Research and Management, Editorial Taylor & Francis online.

Canadian Journal of Microbiology, Editorial NRC Research Press.

Journal of Agricultural and Crop Science, Editorial Wiley Online Library.

Journal of Applied Microbiology, Editorial Wiley Online Library.

Journal of Environmental Management, Editorial Elsevier.

Plant and Soil, Editorial Springer.

Plant Growth Regulation, Editorial Springer.

RSC Advances, Editorial, RSC publishing.

Ecotoxicology and Environmental Safety, Editorial Elsevier.

Science of the Total Environment, Editorial Elsevier.

Scientific Reports, Editorial Springer Nature.