

# Mario A. Sandoval-Molina

✉ mas413bio@gmail.com

🏠 mariosandovalmx.github.io/ecology/

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## Education

### Cornell University-EEB Department

NY, USA

PHD STUDENT.

2022- Present

- Thesis: Ecology and evolution of plant defenses in the Mimosoid clade: thigmonasty, physical and chemical defenses.
- Committee: André Kessler

### Instituto de Ecología (INECOL)-Departamento de Ecología Funcional

Veracruz, México

MASTER OF SCIENCE IN ECOLOGY. GPA: 9.27/10

2019

- Thesis: Interaction between ants, herbivore insects and extrafloral nectaries in *Opuntia robusta*: a test of the defensive function.
- Committee: MK, Janczur, JG, García-Franco, C, Díaz-Castelazo, and Rodolfo Dirzo.

### Universidad Autónoma del Estado de México (UAEM)

Estado de México, México

BACHELOR OF SCIENCE DEGREE IN BIOLOGY. GPA: 8.20/10

2014

- Thesis: Morphology and anatomy of extrafloral nectaries of *Opuntia robusta*.
- Committee: MK, Janczur, and H, Zavaleta-Mancera.

## Research Experience

### Principal Researcher

THE DISTRACTION FUNCTION OF EXTRAFLORAL NECTARIES: KEEPING ANTS AWAY FROM FLOWERS AND PREVENTING

Puebla, Mexico. 2017 - 2018

DISRUPTION OF POLLINATION IN *Ferocactus recurvus*

- Tested the Distraction Hypothesis in the field by conducting an ant-exclusion experiment in *F. recurvus* plants in Tehuacán-Cuicatlán Valley, México.
- Funded by the Cactus and Succulents Society of America.

MORPHOLOGY, ULTRASTRUCTURE AND FUNCTION OF EXTRAFLORAL NECTARIES

Puebla, Mexico. 2017 - 2018

- Analyzed the morphological and ultrastructural characteristics of extrafloral nectaries from two cactus species in Tehuacán-Cuicatlán Valley, México. Examined their function in association with ants and pollinators in the field.
- Funded by the Cactus and Succulents Society of America.

DEFENSE AGAINST HERBIVORES IN *Myriocarpa longipes* (URTICACEAE)"

Veracruz, Mexico. 2019 - 2020

- Principal Investigator: Dr.Mariusz Janczur
- Conducted field work related to analyzing the effect of ants and domatia position on herbivore damage of *Myriocarpa longipes*.

MORPHOLOGICAL AND ANATOMICAL DESCRIPTION OF EXTRAFLORAL NECTARIES OF *Opuntia robusta*

COLPOS, Mexico. 2015

- Conducted laboratory work using different microscopical techniques, such as TEM, SEM, and light. This was part of a research internship at Colegio de Postgraduados.

### Collaborator

EVOLUTION OF DEFENSE AGAINST HERBIVORES IN PLANTS: AN OPTIMAL MODEL ALLOCATION AND FIELD STUDY

Hidalgo, Mexico. 2012 - Present

- Principal Investigator: Dr.Mariusz Janczur
- Conducted field work related to collect tissues for secondary metabolite analysis, arbuscular mycorrhizal fungi, measuring plant defensive traits and seed set of *Opuntia robusta* plants.

### Volunteer Research Assistant

OPTIMAL DEFENSE THEORY IN *Mimosa pudica*

Cornell University. Apr 2021 - Dec 2021

- Collaborators: Dr. André Kessler
- Greenhouse work analyzing leaf movement, and response to herbivory.

PLANT-POLLINATOR INTERACTION NETWORKS

Cornell University. Apr 2021 - Sept 2021

- Collaborators: MSc. Zaidee Powers
- Collected and identified insect pollinators in the botanic garden and natural areas. Performed plant-pollinator interaction network analysis.

## Publications

### PEER-REVIEWED PUBLICATIONS:

1. **Sandoval-Molina, M. A.**, Gracia-Franco, J. G., Díaz-Castelazo, C. and Janczur M. K. (2023) Plant sex change the outcome of ant-plant interactions in a facultative myrmecophytic cactus. *Functional Ecology*, 00, 1– 13.  
DOI: <https://doi.org/10.1111/1365-2435.14267>
2. **Sandoval-Molina, M. A.**, Lugo-García, B. R., Mendoza-Mendoza, A. D., and Janczur M. K. (2021). Females restrict the position of domatia and suffer more herbivory than hermaphrodites in *Myriocarpa longipes*, a Neotropical myrmecophyte. *Journal of Tropical Ecology*.  
DOI: <http://dx.doi.org/10.1017/S0266467421000584>
3. Janczur, M. K., González-Camarena, E., Leon-Solano H.J, **Sandoval-Molina, M. A.**, Bartosz J. (2021). Impact of the female and hermaphrodite forms of *Opuntia robusta* on the plant defence hypothesis. *Scientific Reports* 11, 12063.  
DOI: <https://doi.org/10.1038/s41598-021-91524-5>

4. **Sandoval-Molina, M. A.**, Flórez-Gómez, N. A., Reyes-Tovar, J. M., Pérez-Botello, A. M., Hinojosa-Díaz, I. A., Ayala, R. (2020). Effects of floral display and abiotic environment on the foraging activity of bees on *Kallstroemia pubescens* (Zygophyllaceae). *Ethology Ecology Evolution* 32(6), 551-571. DOI: <https://doi.org/10.1080/03949370.2020.1755371>
5. **Sandoval-Molina, M. A.**, Zavaleta-Mancera, H. A., León-Solano, H., Solache-Ramos, L., Jenner, B., Morales-Rodríguez, S., Patrón-Soberano, A. and Janczur M. (2018). First description of extrafloral nectaries in *Opuntia robusta* (Cactaceae): anatomy and ultrastructure. *PLOS ONE* 13(7). DOI: <https://doi.org/10.1371/journal.pone.0200422>

#### NON-PEER-REVIEWED PUBLICATIONS:

1. **Sandoval-Molina, M. A.**, Gónzales-Camarena, E., Rosas-Sánchez J., Janczur M. K. The Distraction Function of Extrafloral Nectaries: Keeping Ants Away From Flowers and Preventing Disruption of Pollination in *Ferocactus recurvus*. *EcoEvoRxiv preprint*. <https://doi.org/10.32942/X27W3W>
2. **Sandoval-Molina, M. A.**, Morales-Rodríguez, S., Janczur, M. K. (2023). Morphological and anatomical characterization of extrafloral nectaries of *Opuntia streptacantha* and *Ferocactus recurvus* (Cactaceae). *EcoEvoRxiv preprint*. URL: <https://doi.org/10.32942/X2PW2J>
3. **Sandoval-Molina, M. A. (2021)**. tlamatini: Funciones utiles para biologxs y ecologxs confundidos con los modelos lineales. R package version 0.1. URL: <https://zenodo.org/doi/10.5281/zenodo.7765346>
4. León-Solano, H. J., Janczur, M. K., González-Camarena, E., Czarnoleski, M., Jenner, B., **Sandoval-Molina, M. A. (2021)**. Resource Allocation Among Cladodes of *Opuntia robusta* From East-central Mexico, PREPRINT (Version 1) available at Research Square [<https://doi.org/10.21203/rs.3.rs-161086/v1>]

#### PEER-REVIEWED PUBLICATIONS IN PROCESS:

1. Bata-Benitez, R, Nowakowski, J, Rosas-Sánchez, JJ, Lugo-García, BR, Fernández-Villavicencio, MJ, **Sandoval-Molina, M. A.**, Janczur, M. K. Disturbance of a deciduous tropical forest increases the competition between migratory and resident or endemic birds. *Ecological Engineering* [Manuscript submitted]
2. Macotela, L., **Sandoval-Molina, M. A.**, Venebra-Muñoz, A., Anaya, M., González-Morales, J. C., Daniel E. Naya and Manjarrez, J. Histomorphological changes due to altitude in a high-altitude lizard (*Sceloporus grammicus*) from three mountain systems? *J Therm Biol* [Manuscript in preparation]
3. Martínez-Estrella, D; Mariezcurena-Berasain M. D, **Sandoval-Molina, M. A.**, Janczur M. K. Implications of the existence of different sexual forms on the interaction with arbuscular mycorrhizal fungi in a dioecious population of *Opuntia robusta* Wendl. (Cactaceae). *Scientific Reports*. [Manuscript in preparation]
4. Rosas-Sánchez J., Janczur, M. K., Nowakowski, J. K., Lugo-García B., Bata-Benítez R., Flores-Dimas, C. A., **Sandoval-Molina, M. A.**, Carbajal, A. Are morphological traits of individuals of *Junco phaeonotus* associated with habitat disturbance and casually associated with infection by *Coccidia*? *Ecological Engineering* [Manuscript in preparation]

## Fellowships, awards, and grants

2024	<b>Grant: Cornell Atkinson Center for Sustainability (SBF)</b> , Amount: \$7,264.00	NY, USA
2023	<b>Grant: Cornell Chapter of Sigma Xi</b> , Amount: \$1,000.00	NY, USA
2023	<b>Grant: Andrew W. Mellon Student Research</b> , Amount: \$1,000.00	NY, USA
2023	<b>Grant: EEB-Cornell University, Department Summer Research Support</b> , Amount: \$1,000.00	NY, USA
2022	<b>Award: EEB Book Award</b> , EEB Cornell University Annual Graduate Student Symposium	NY, USA
2022	<b>Fellowship: Graduate Education- PhD</b> , Consejo Nacional de Ciencia y Tecnología (CONACYT)	México
2017	<b>Grant: Cactus and Succulents Society of America</b> , Amount: \$2,616.21	CA, USA
2016	<b>Fellowship: Graduate Education</b> , Consejo Nacional de Ciencia y Tecnología (CONACYT)	México
2014	<b>Fellowship: Bachelor's Research</b> , Secretaría de Educación Pública and CONACYT	México

## Conferences and symposiums

Speaker at 8 National Conferences and symposiums (in Mexico).

Speaker in 4 International Conferences and symposiums.

## Outreach

Nine science communication publications in several Mexican newspapers. 2012-2016

One science communication publication in the magazine of Social Sciences entitled "The Ixion Wheel", Faculty of Humanities, Universidad Autónoma del Estado de México, 2012.

## Professional societies and scientific associations

<b>EcoEvoRxiv preprints</b> . Editorial Committee.	2023 - Present.
<b>Botanical Society of Mexico</b> . Student member.	2016 - Present.
<b>Mexican Scientific Society of Ecology</b> . Student member.	2017 - Present.