

## Vita

Candidate's name: Melina Paz Galeano

Universities  
Attended: University of New Brunswick (2021)  
Bachelor of Science, Honours

University of New Brunswick (2022)  
Masters of Science

### Publications:

Improved protein glycosylation enabled heterologous biosynthesis of monoterpenoid indole alkaloids and their unnatural derivatives in yeast. Yang Qu; Mohammadamin Shahsavarani; Joseph Christian Utomo; Rahul Kumar; Melina Paz-Galeano; Jorge Jonathan Oswaldo Garza-García; Zhan Mai; Dae-Kyun Ro - Manuscript submitted for publication

## Discovery of Sarpagan Bridge Enzyme-Mediated Pericyclivine Biosynthesis

UNIVERSITY OF NEW BRUNSWICK  
THESIS DEFENCE AND EXAMINATION  
in Partial Fulfillment  
of the Requirement for the Degree of  
Master of Science

by

**Melina P. Galeano**

in the Department of Chemistry

U.N.B., Fredericton, N.B.

**Thursday, August 25<sup>th</sup>, 2022  
10:00 a.m.**

Via MS TEAMS

Examining Committee

Dr. Yang Qu	Supervisor
Dr. Barry Blight	Internal Examiner
Dr. Shawn MacLellan	Int-Ext Examiner
Dr. Gilles Villemure	Chair of Oral Examination

## Abstract

Sarpagan Bridge Enzymes (SBEs) are cytochrome P450 monooxygenases catalyzing the coupling reaction of the C5-C16 sarpagan bridge in the biosynthesis of many sarpagan type monoterpenoid indole alkaloids. This includes the anti-arrhythmic drug ajmaline in *Rauwolfia serpentina* from the Apocynaceae plant family. Despite SBE enzymatic activity first being detected over 20 years ago, only a handful of these enzymes have been identified and characterized. Here, we report the discovery and characterization of two new SBEs in the plants *Catharanthus roseus* and *Tabernaemontana elegans*. Through virus-induced gene silencing and a series of in vivo and in vitro assays, we confirmed these enzymes catalyze the cyclization and aromatization reactions

characteristic to SBEs. Furthermore, the addition of *C. roseus* and *T. elegans* leaf total proteins to in vitro assays confirmed these SBEs' involvement in pericyclivine biosynthesis. The discovery of these two enzymes continues to expand our knowledge on the pathways SBEs are found in and adds another step in the complete elucidation of perivine and vobasine biosynthetic pathways.