Vita

Candidate's name: Scott Galeung Alexander Mann

Universities Attended:

University of New Brunswick (2024)
Bachelor of Science

University of New Brunswick (2025)
Masters of Science

Publications/Conference Presentations:

Mann, S. G. A.; Richardson, M. B.; Young, R. N.; Deslongchamps, G.; Qu, Y. Regiospecific hydroxylase and *O*-methyltransferase for the biosynthesis of anticancer alkaloids in *Tabernaemontana elegans* (toad tree). *Plant Physiol. Biochem.* **2025**, 110161.
https://www.journals.elsevier.com/plant-physiology-and-biochemistry

Mann, S. G. A.; Paz-Galeano, M.; Shahsavarani, M.; Perley, J. O.; Guo, J.; Garza-Garcia, J. J. O.; Qu, Y. Stereochemical Insights into Sarpagan and Akuammiline Alkaloid Biosynthesis. New Phytol. 2025, https://doi.org/10.1111/nph.70272

Plant Canada Conference Poster Presentation, Winnipeg, MB, July 11, 2024

Identification and Biochemical Characterization of Stereospecific and Regiospecific Cytochrome P450 Monooxygenases for Monoterpenoid Indole Alkaloid Biosynthesis

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Scott G. A. Mann

in the Department of Chemistry

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

Thursday, December 4th, 2025
9:00 a.m.

Toole Hall, Room 3

Examining Committee

Dr. Yang Qu	Supervisor
Dr. Barry Blight	Internal Examiner
Dr. Timothy Erickson	Int-Ext Examiner
Dr. Adam Dyker	Chair of Oral Examination

Abstract

Cytochrome P450 monooxygenases (CYPs) are a superfamily of heme-containing oxidases vital to detoxification and biosynthesis of specialized metabolites, including pharmaceutically relevant monoterpene indole alkaloids (MIAs). These enzymes catalyze various reactions such as ring closures and hydroxylations, which contribute to scaffold diversity and reactivity of these compounds. Despite their significance, many CYPs remain uncharacterized. This thesis identifies and characterizes several novel CYPs in MIA biosynthetic pathways.

First, I report the biochemical characterization of a sarpagan bridge enzyme (SBE) from *Catharanthus roseus*, the in planta functional of which was supported via virus-induced gene silencing. With CrSBE and three more SBE orthologs from *Tabernaemontana elegans*, *Rauvolfia serpentina*, and *Vinca minor* in the Apocynaceae family, I show that SBEs cyclize geissoschizine to 16*R* sarpagan scaffold. I further show that downstream deformylase and reductase activities epimerize C16, forming species-specific C16 sarpagan epimers that feed into distinct products, such as the anti-arrhythmic ajmaline.

Second, I identify and biochemically characterize a *Tabernaemontana elegans* enzyme pair coronaridine 11-hydroxylase (TeC11H) and 11-hydroxycoronaridine *O*-methyltransferase (TeHCOMT), which catalyze C11-methoxylation of coronaridine. This transformation primes the indole for coupling reactions that yield bis-iboga-vobasinyl MIAs, compounds with anticancer and anti-autophagy potential, and distinguishes the enzymes from a closely related enzyme pair for coronaridine 10-methoxylation from *Tabernanthe iboga*

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