2013 REU Poster: Modulation of Indolic Plant Defense compound Synthesis by Tryptophan Analogs

Sanon, Marie Prisca

http://hdl.handle.net/2144/12985

Boston University
Modulation of Indolic Plant Defense compound Synthesis by Tryptophan Analogs

Marie Prisca Sanon
Celenza Lab/ Boston University

Abstract
Like bacteria and fungi, plants are able to synthesize aromatic amino acids Tyrosine (Tyr), Phenylalanine (Phe) and Tryptophan (Trp). Those amino acids are used in plants not only for protein synthesis, but also for a variety of compounds that control development and defense. Arabidopsis thaliana uses Trp to produce distinct secondary metabolites that function as deterrents to herbivory (indole glucosinolates), as defense against microbial pathogens (camalexin) and as growth regulators (indole-3-acetic acid). To better understand the relationship between Trp biosynthesis and indole glucosinolate (IGs) production, we have tested different analogs of Trp on Columbia, a wild-type Arabidopsis accession. We have found that α-methyl tryptophan cannot be incorporated into IGs and in fact inhibits IG synthesis.

Arabidopsis thaliana (A.T.)
• A small flowering plant native to Europe, Asia and northwestern Africa.
• Member of the Brassicaceae family -informally known as mustards, mustard flowers or cruciferae.

Aromatic Amino Acids in A.T.

Experimental Methods
10 days after germination in liquid PNS medium, the plants were fed with 100µM of α methyl tryptophan (α-MT) at varying induction time: 24h, 48h, 72h before collection.

Results
Indole glucosinolates production at varying induction times with 100 µM of α-MT.

The longer the treatment the lesser I3M production.

Hypothesis
We expected that the α positioned methyl group on Trp (α-MT) would interfere with the reaction by preventing the enzymes (CYP79B2 and CYP79B3 ) from cleaving off the carboxyl group. As a result, the indole-3-acetaldoxime, which is necessary for glucosinolate synthesis, could not be formed.

IG Biosynthetic Pathways

Conclusion
• α-MT cannot be efficiently incorporated
• α-MT inhibits IG synthesis

Future Goals
• Extend the treatment time to confirm a decrease in 1MOI3M and 4MOI3M production
• Incorporate α-MT directly into leaves
• Expose the treated plants to potential herbivores to determine if differences in indolic glucosinolate production are really significant
• For 5- and 6-MT confirm the structure of the putative methylated IGs that comes off at 26.6 min

Acknowledgments
• Dr. John Celenza
• Dr. John Snyder
• Sandra Zoli
• Frank Wong
• Luisa Ocampo
• Michael Quintin

Reference