



Regulation and modeling of lignin biosynthesis a systems biology approach

Undergraduate Summer Research Experience

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Objectives



- Provide summer research experience in Plant Genomics
- Increase graduate related research opportunity to under-represented groups





Process

- Ad was placed at St Augustine's College and North Carolina State University
- Ad was circulated to the biology, chemistry, and all engineering departments
- Several students expressed interest and resumes were reviewed.



Undergraduate Summer 2010 Research Results

- Two undergraduate students performed research
 - Ms. Courtney Mosley from St. Augustine's College, Mr. Jaron Hinton from NC State University. Ms Mosley is a rising senior in Biology. Mr. Hinton is also a senior in Biology specializing in biotechnology and genetics.

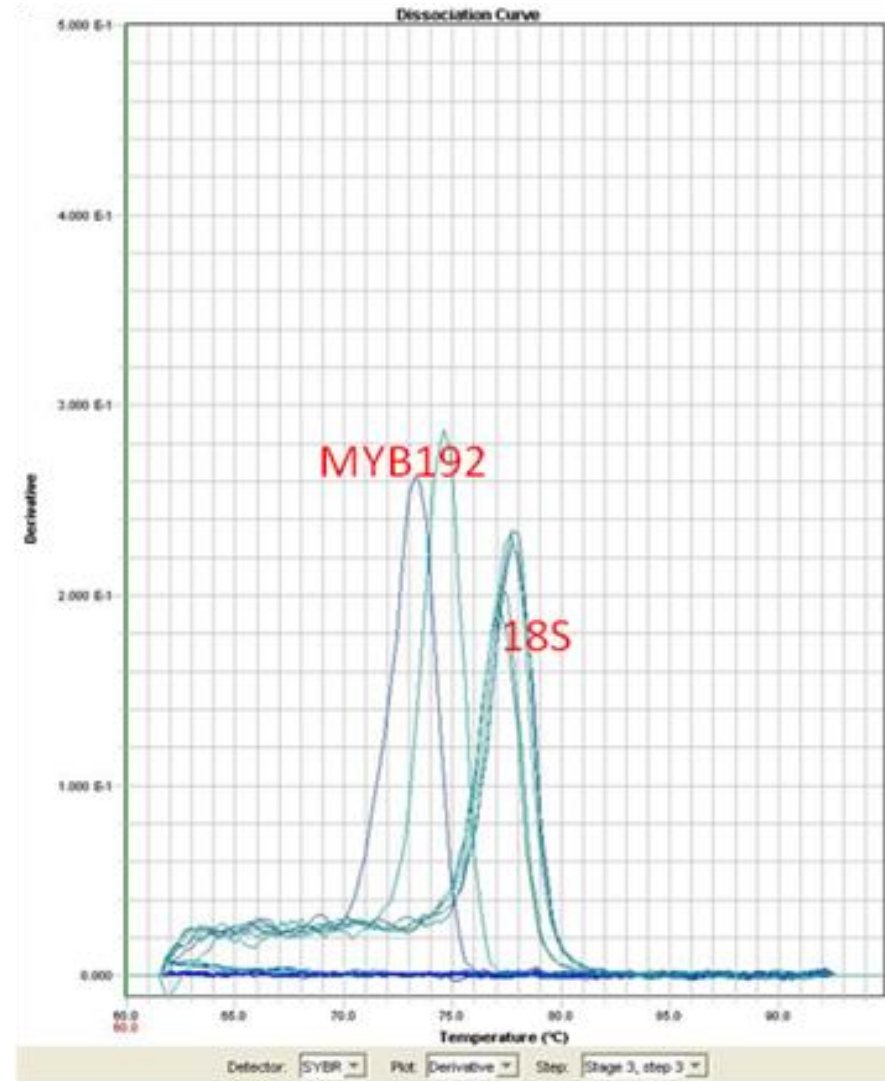
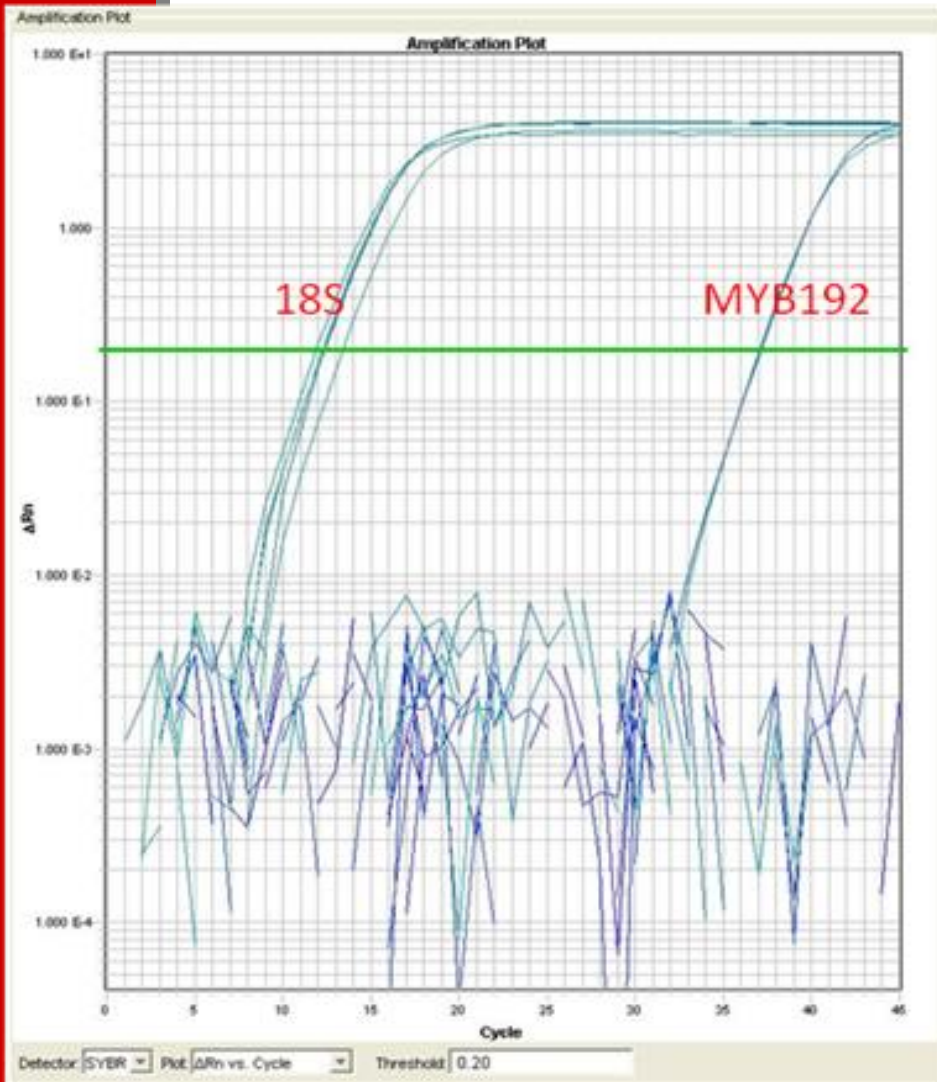
Undergraduate Research:

- Examined enzyme (laccase) activity in transgenic plants
- Examined expression pattern of MYB192 and MYB028 genes
- Created bacteria containing new transgenic DNA
- Cultured bacteria for isolation and purification of plasmid DNA containing genes of interest



Undergraduate 2010 Summer Research Results

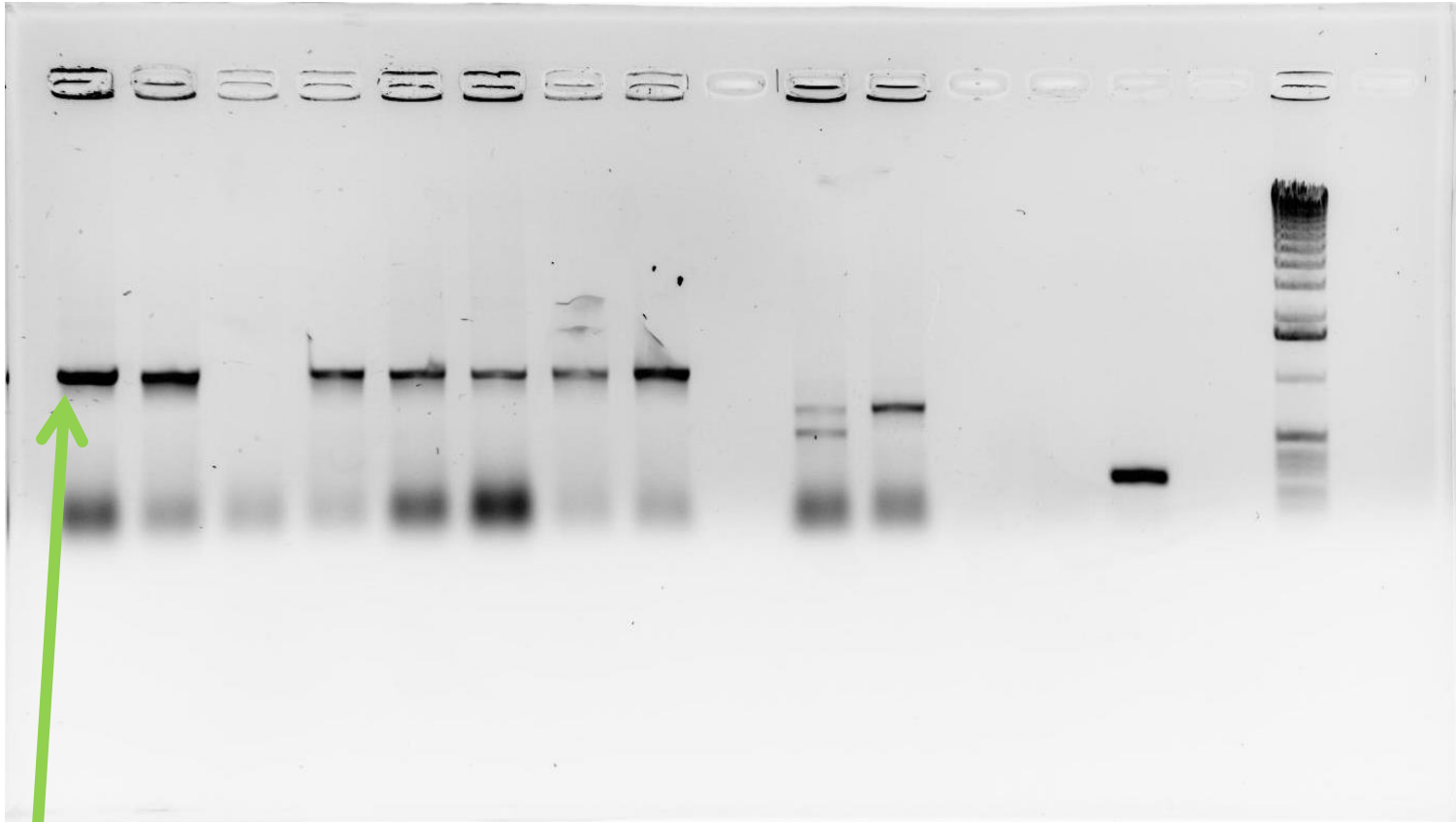
qRT-PCR Testing of MYB Primers (18S and 028). The peaks of the MYB192 gene on each graph show that this gene expression in *P. trichocarpa* is weak.





Undergraduate 2010 Summer Research Results

Gel after amplification of MYB 028



DNA band approximately 1,600
bps long



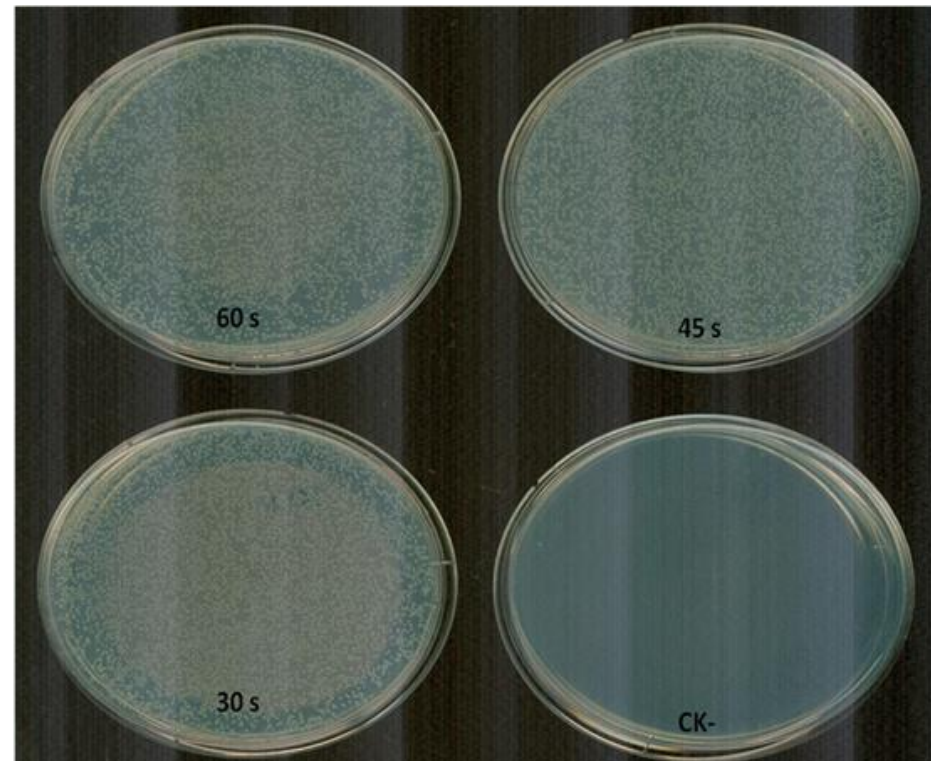
Undergraduate 2010 Summer Research Results

Bacterial Transformation

Figure (left). Confirming that the solution quantity did not affect the amount of clones produced.



Figure (right). Confirming that incubation time variations did not affect the efficiency of the bacterial clones.

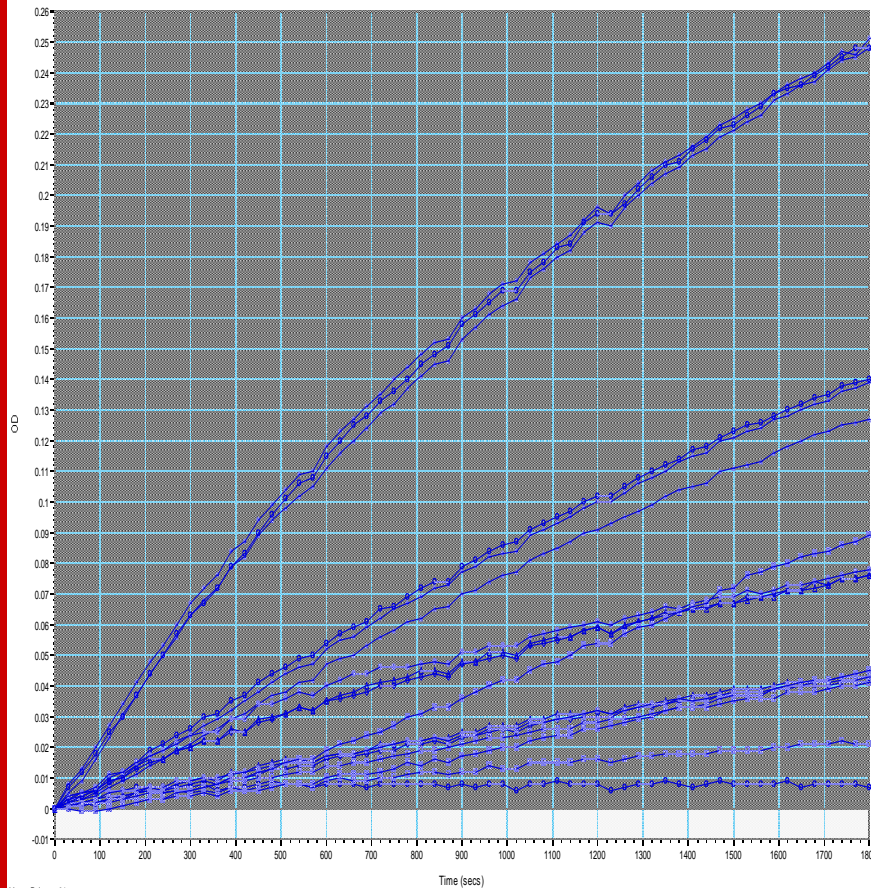




Undergraduate 2010 Summer Research Results

Laccase Activity Assay

pH 5.0, 20 ul and 50 ul extracts of wt and miR397a-9 mature leaves, 37C



Wild-type leaves

Transgenic leaves

Controls

- Wavelength = 420 nm
- 50 ul protein
- Sodium acetate buffer
pH = 5.0
- Samples @ 37°C

Vmax Points = 61

Well	A1	A2	A3	A4	A5	A6	A7	A8	A9	B1	B2	B3	B4	B5	B6	B7	B8
Vmax	0.080	0.685	1.459	1.430	1.411	1.561	4.414	4.760	4.758	1.399	2.416	2.436	2.384	3.340	8.124	8.080	8.155
R ²	0.257	0.986	0.993	0.994	0.995	0.979	0.997	0.996	0.996	0.998	0.978	0.984	0.965	0.994	0.983	0.976	0.980

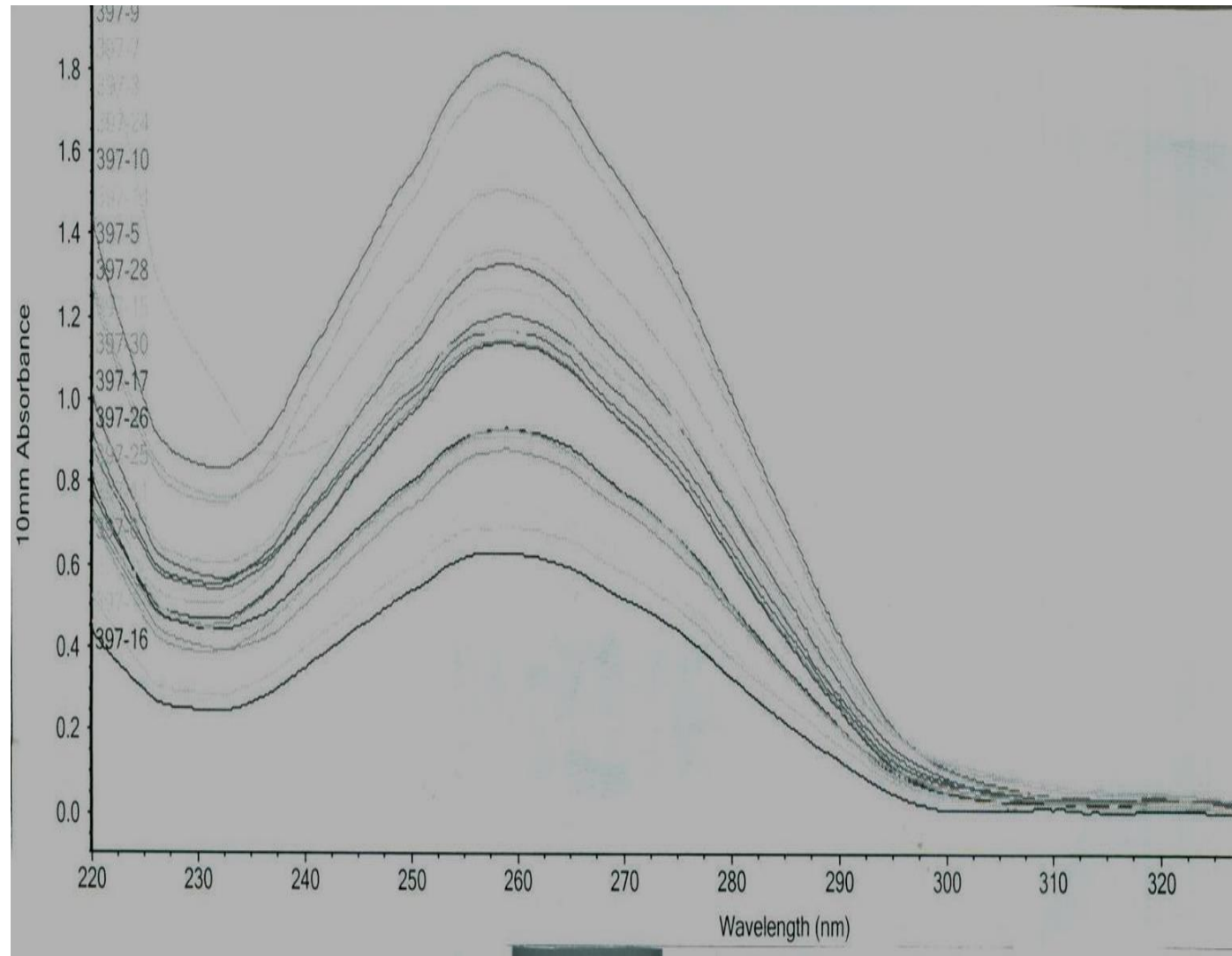


Undergraduate 2010 Summer Research Results

Analyzed the DNA concentration via the Nano-drop Spectrophotometer.

**Nucleic Acid
Conc.
($\mu\text{g}/\text{mL}$)**

Sample ID	Nucleic Acid Conc. ($\mu\text{g}/\text{mL}$)
H2O	-0.2
397-5	59.7
397-6	43.3
397-7	87.3
397-8	74.6
397-9	91.2
397-10	65.8
397-11	44.9
397-13	34
397-14	62.8
397-15	57.9
397-16	30.8
397-17	56.2
397-18	36.8
397-24	67.4
397-25	45.7
397-26	45.9
397-28	57.9
397-30	56.6





Undergraduate 2010 Summer Research Results

Ms Courtney Mosley Research

- **First Place: St. Augustine Annual Research Presentation Competition**



Undergraduate Summer Research 2011

- Two new undergraduate students have been identified
 - Mr. Jamian Smith from St. Augustine's College and Mr. Ransford Dampety from NC State University. Mr. Smith is a senior in Engineering Mathematics. Mr. Dampety is a junior with a double major in Chemical Engineering and Applied Mathematics.
- Students will be working on the modeling portion of the project
- Potential projects include:
 - Steady State Analysis of Regulatory Signaling model
 - Steady State Analysis of Metabolic flux model
 - Development and execution of Continuous Boolean Kinetic model
 - Uncertainty and Sensitivity analysis of Continuous Boolean Kinetic model

Undergraduate Summer Research Experience

- Questions
- Questions
- Questions