INTRODUCTION
Background and Importance Overview

What is Fast Pyrolysis?
- Catalytic Fast Pyrolysis is a process in which a feedstock (biomass) is heated to temperatures of roughly 500°C, in the absence of oxygen, and the resulting vapors are subjected to oxygen removal using a catalyst. The purpose of this research is to improve the yield of fuel range products from biomass pyrolysis, and to eventually offset petroleum-based fuels, products, and energy with bio-based ones.

What issues are researchers facing in the biofuel arena?
- The main issue that we are facing in regards to biomass fuel is the final yield of fuel range vapors produced from pyrolysis.

METHODS AND PROCEDURE
Biomass Preparation and Pyrolysis

Transgenic Biomass Preparation
The feedstock used for this experiment was infected by Agrobacterium. This unicellular species releases DNA plasmid into cells of the host plant which then becomes part of the genome of the plant. This plasmid was genetically modified to translate into an increase of iron binding protein that the plant would produce. Thus, the protein binding content would increase the plants iron uptake during growth.

Iron Binding Protein Content Analysis
- The biomass’s iron content was calculated by calculating the absorbance levels of the extracted iron binding protein.

Mass Spectra Results
- The mass spec for the biomass was collected for each sample stem and leaf separately. The results show that there is a significant difference in the iron content between the two species. The red and blue lines are inseparable. While there is a large change in the lignin expression of Arabidopsis, Arabidopsis has been found to accumulate iron in consistent proportions throughout tissue and was the first plant at NREL to be modified with ferritin, iron binding protein.

MBMS SPECTRA AND DATA ANALYSIS
Results and Discussion

Mass Spectral Average and Normalization
- The normalized mass spectra displays minor changes in the lignin content of the transgenic Poplar and Switchgrass biomass. While the Arabidopsis shows overexpressed lignin content once pyrolyzed. There is a visible trend in the low carbohydrates of the Arabidopsis and Poplar leaves and stem.

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FUTURE RESEARCH
How has the Iron effected the way Biomass growing and harvesting is done

How does enhanced iron binding affect biomass growth, and how do changes in pyrolysis vapors impact catalytic fast pyrolysis yields?
- The next step in addressing the effects of iron accumulation in plants is using a zeolite. ZSM5 catalysis with fast pyrolysis. ZSM5 has the ability to upgrade and convert pyrolysis vapors into hydrocarbons which will provide a greater understanding on aromatics formation and how biomass can be improved for thermochemical conversion.

ACKNOWLEDGMENTS
Great Thanks!

First, I would like to express my sincere gratitude to my mentor Daniel Carpenter on his help and support. I would also like to acknowledge Kevin Lin, Bryon Donohoe, and Hui Wei for their patience and help with preparing the biomass for pyrolysis. I would like to thank Anne Stance and Calvin Mukaraka, for their guidance and advice. I thank the Department of energy’s Office of Science and the National Renewable Energy Laboratory (NREL). Finally, I would like to thank Marcus Giron, Linda Lung and DOE’s NREL, for their awesome efforts to help make the best out of the SULI program.