



# Fundamental Understanding of Converting *Buddleja davidii* to Bioethanol

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### PROGRAM DESCRIPTION

- Development of alternative energy, especially for transportation fuel, is becoming a global urgent priority.
- Biofuels, such as bioethanol, derived from lignocellulosic materials are promising sources of energy.
- Finding suitable bioresources and fundamentally understanding the processes involved in the production stream are two key factors in developing low-cost cellulosic ethanol.



### TECHNICAL DETAILS

- The bioresource must have agro-energy features and no food value. *Buddleja davidii* has such features.
- Fundamental Understanding include:
  - Detailed biomass characterization
  - Pretreatment of biomass
    - Investigating compositional & structural changes of cellulose and lignin.
  - Enzymatic hydrolysis – determining the efficiency
  - Fermentation – amount of ethanol produced
- Techniques used:
  - Solid-state,  $^{13}\text{C}$ ,  $^{31}\text{P}$ , 2D, and DEPT NMR
  - GPC and light microscopy.



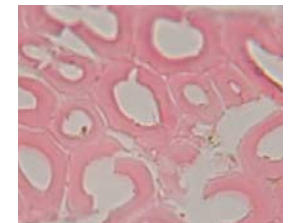
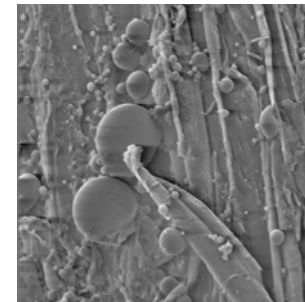
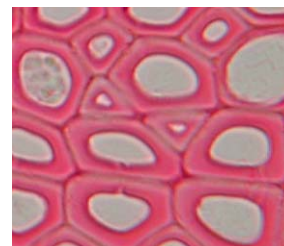
### PAYOFF

- Finding new bioenergy resource that could be available in different regions in the world.
- Increasing our fundamental knowledge in this field will allow for significant advancements to unlock cheap cellulosic ethanol.
- New energy source can be developed that can reduce the problem of limited fossil fuels and climate change.



### KEY ACCOMPLISHMENTS

- Biomass characterization of *Buddleja davidii*.
- Ethanol organosolv pretreatment
- Efficient enzymatic hydrolysis.
- Structural characterization of cellulose and lignin
- Microscopic investigation of pretreated *B. davidii*.



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