



Primary
Industries



Richmond
Landcare
Inc.

Developing rapid tools for characterising biochar carbon stability

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UK Biochar Research Centre



CARING
FOR
OUR
COUNTRY

Acknowledgements

- **NSW DPI**

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- Elspeth Berger
- Josh Rust
- Nichole Murray
- Greg Smith

- **Pacific Pyrolysis**

- Adriana Downie

- **Frontier Laboratories**

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- Akihiko Hosaka
- Mr Shiro

- **CSIRO**

- Dr Evelyn Krull

Benefits of biochar ?

- Long term carbon sequestration
 - Biochar carbon essentially “inert”
- Possibility of “priming” for loss of native soil carbon
 - Reduction in or negation of benefit
- Agronomic benefit
 - Changes in soil chemistry and biology

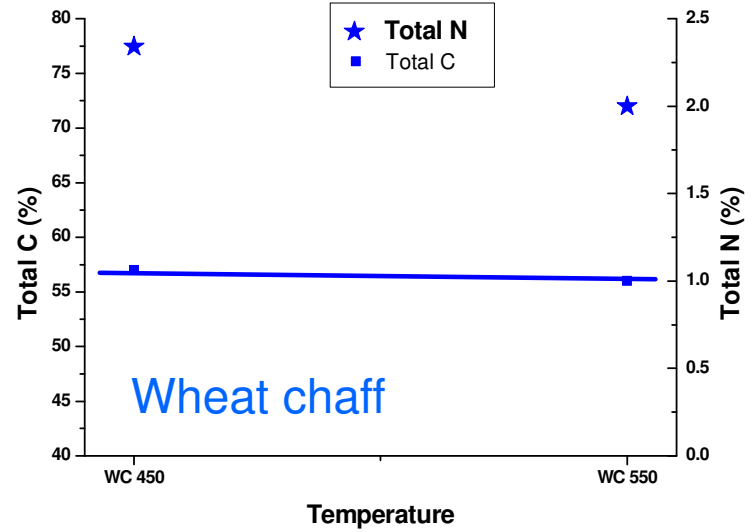
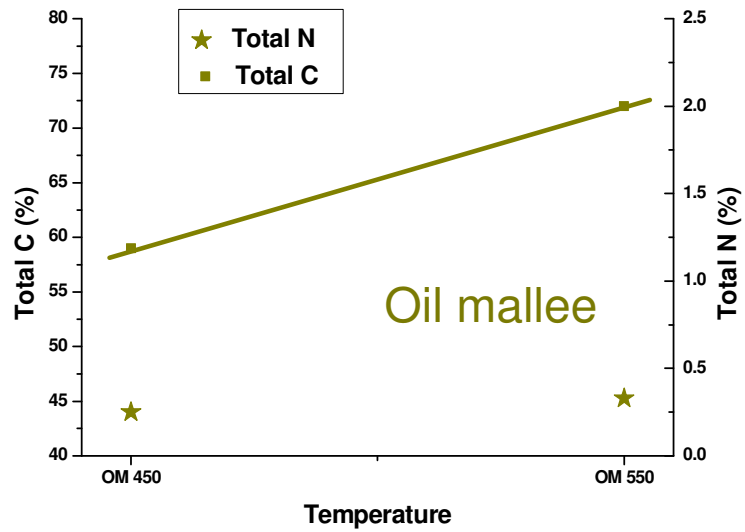
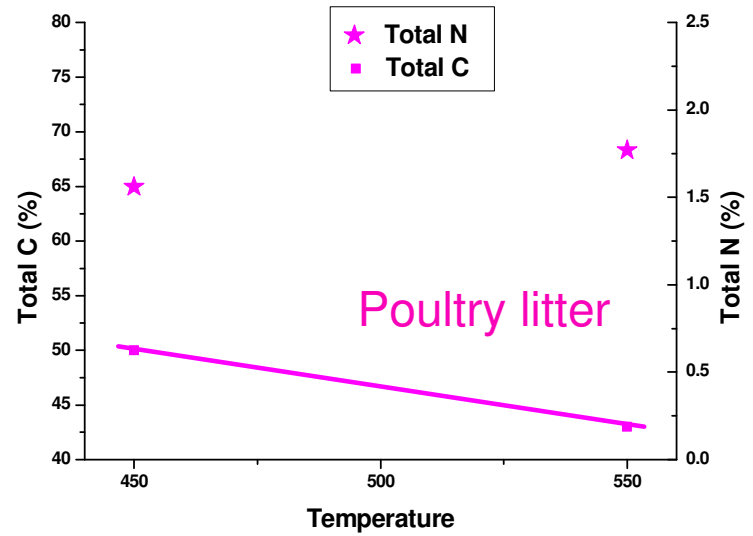
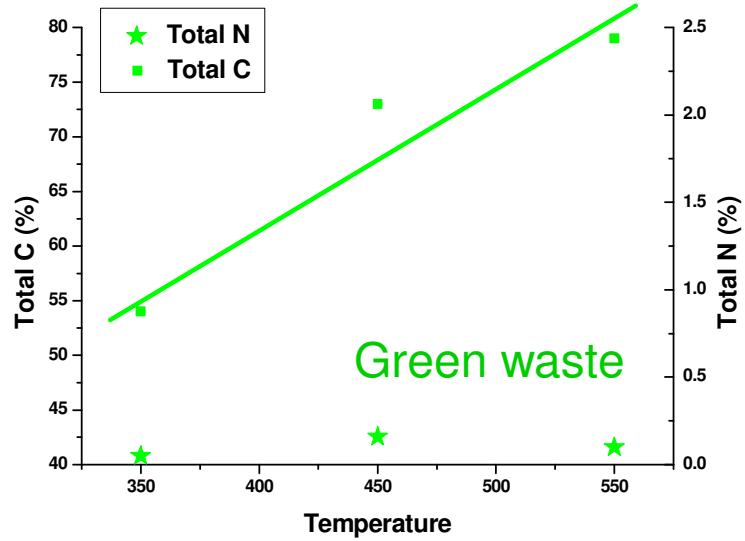
Biochars used in this study

- Green waste biochar #
 - 350 °C
 - 450 °C
 - 550 °C
- Chicken manure*
 - 450 °C
 - 550 °C
- Oil mallee*
 - 450 °C
 - 550 °C
- Wheat chaff*
 - 450 °C
 - 550 °C

Biochars courtesy of Pacific Pyrolysis

* Biochars courtesy of DAFF National biochar project



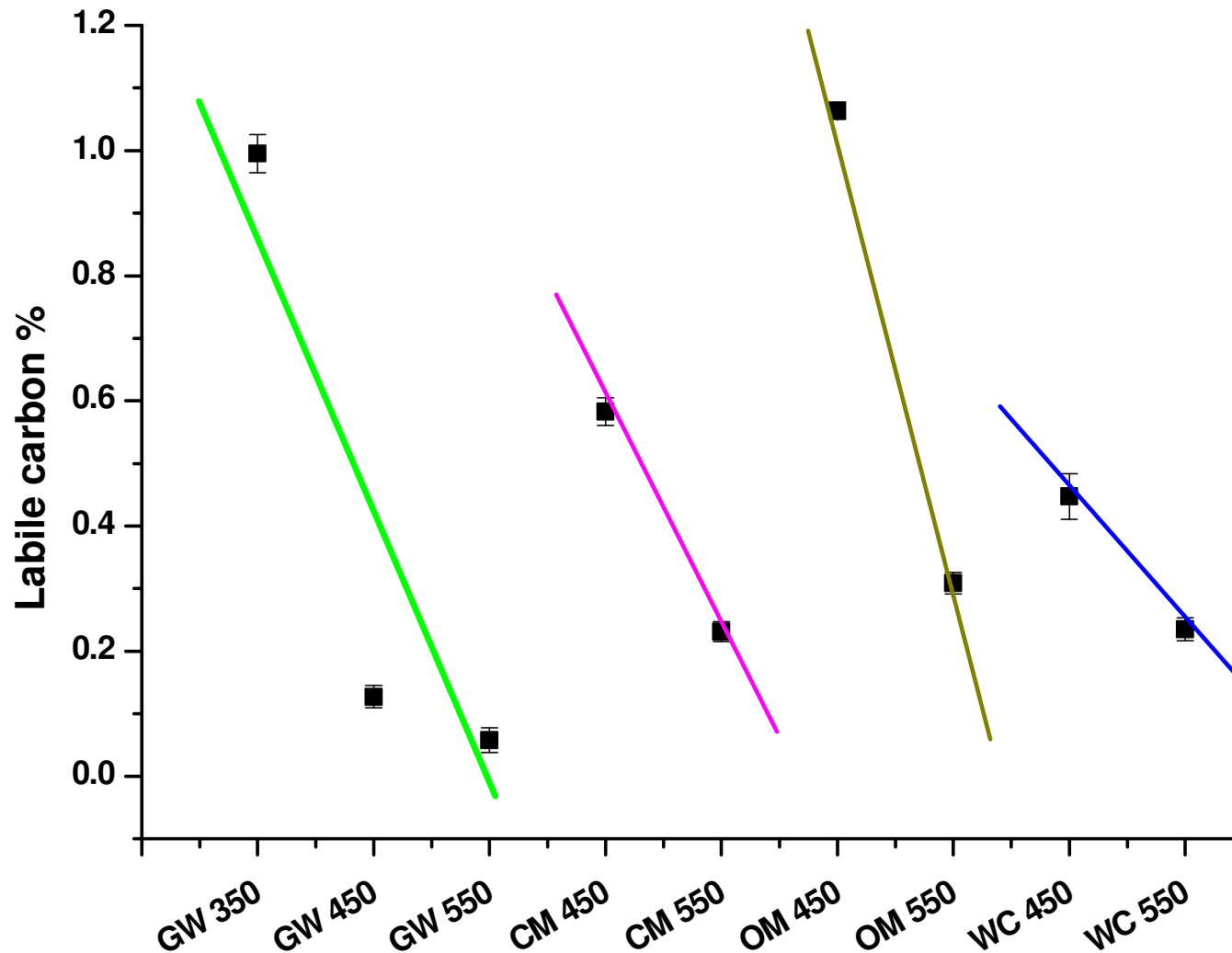


Sample preparation; labile vs stable carbon incubation (UK Biochar centre)

- Dry and grind biochar (105°C, 0.5mm)
- Incubate
 - Sterile quartz sand
 - Microbial inoculant and micronutrients
 - 65% water holding capacity
 - 30°C for 14 days
- Trap and measure CO₂ on soda lime

Cross, A and Sohi, S (2011) The priming potential of biochar products in relation to labile carbon contents and soil organic matter status. *Soil Biology and Biochemistry*, 43, 10, 2127-2134.

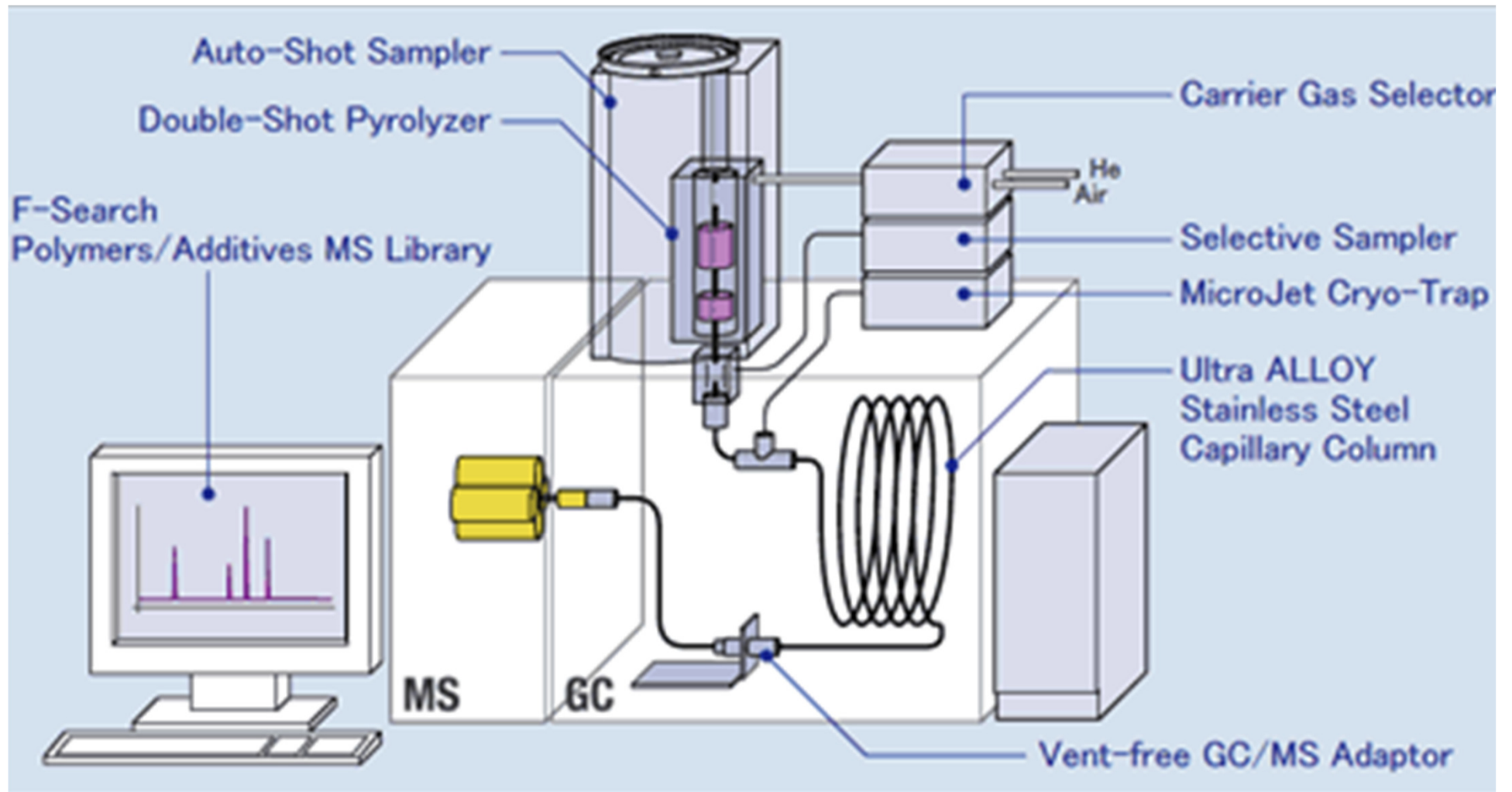
Labile carbon content of biochars



Our capabilities and approach

- EGA / MS
- Thermal desorption / cryofocussing / GC-MS
- Pyrolysis / cryofocussing / GC-MS

Pyrolyser – GC-MS



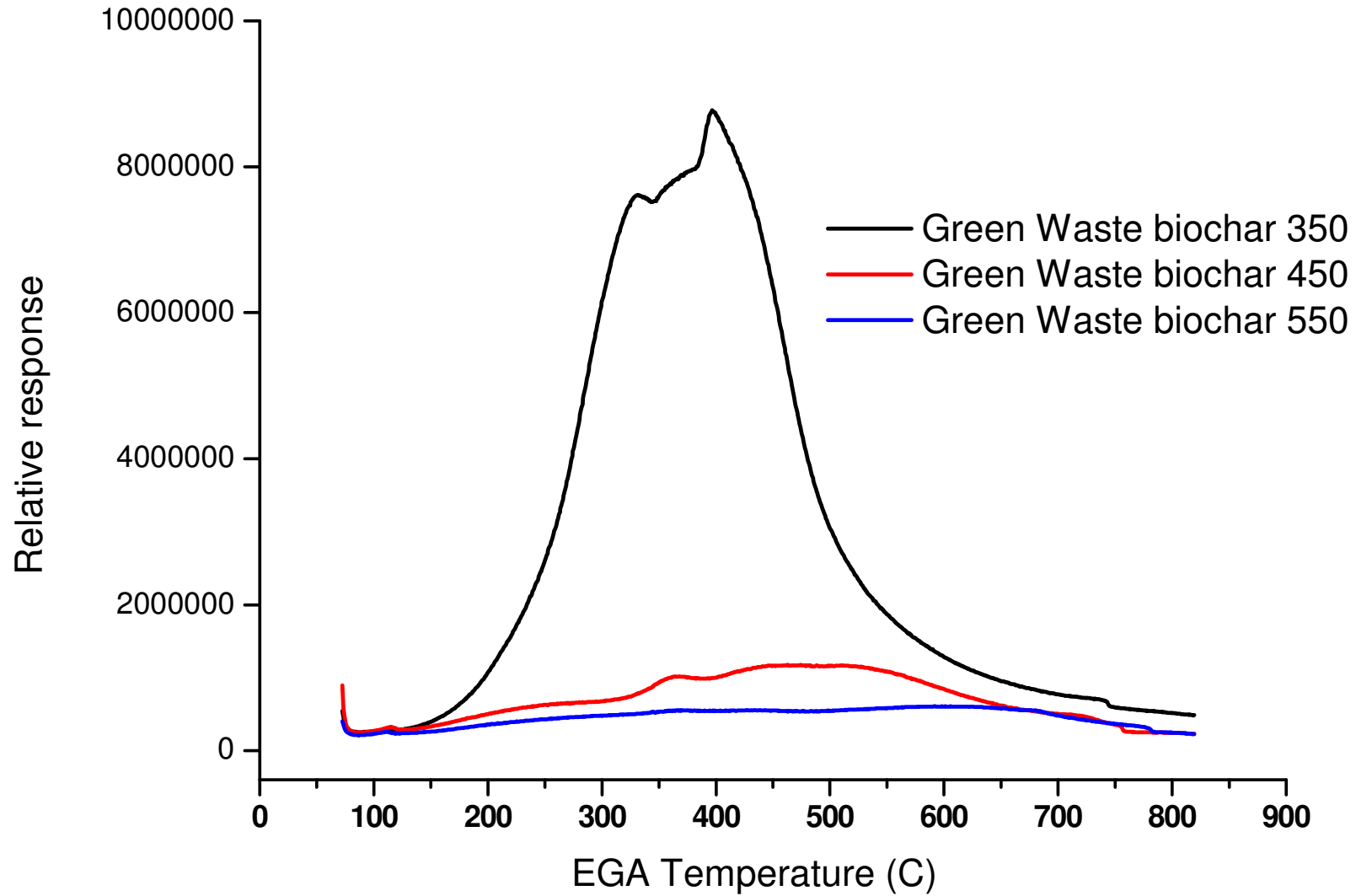
Frontier Laboratories' 2020iD multi-function pyrolyzer



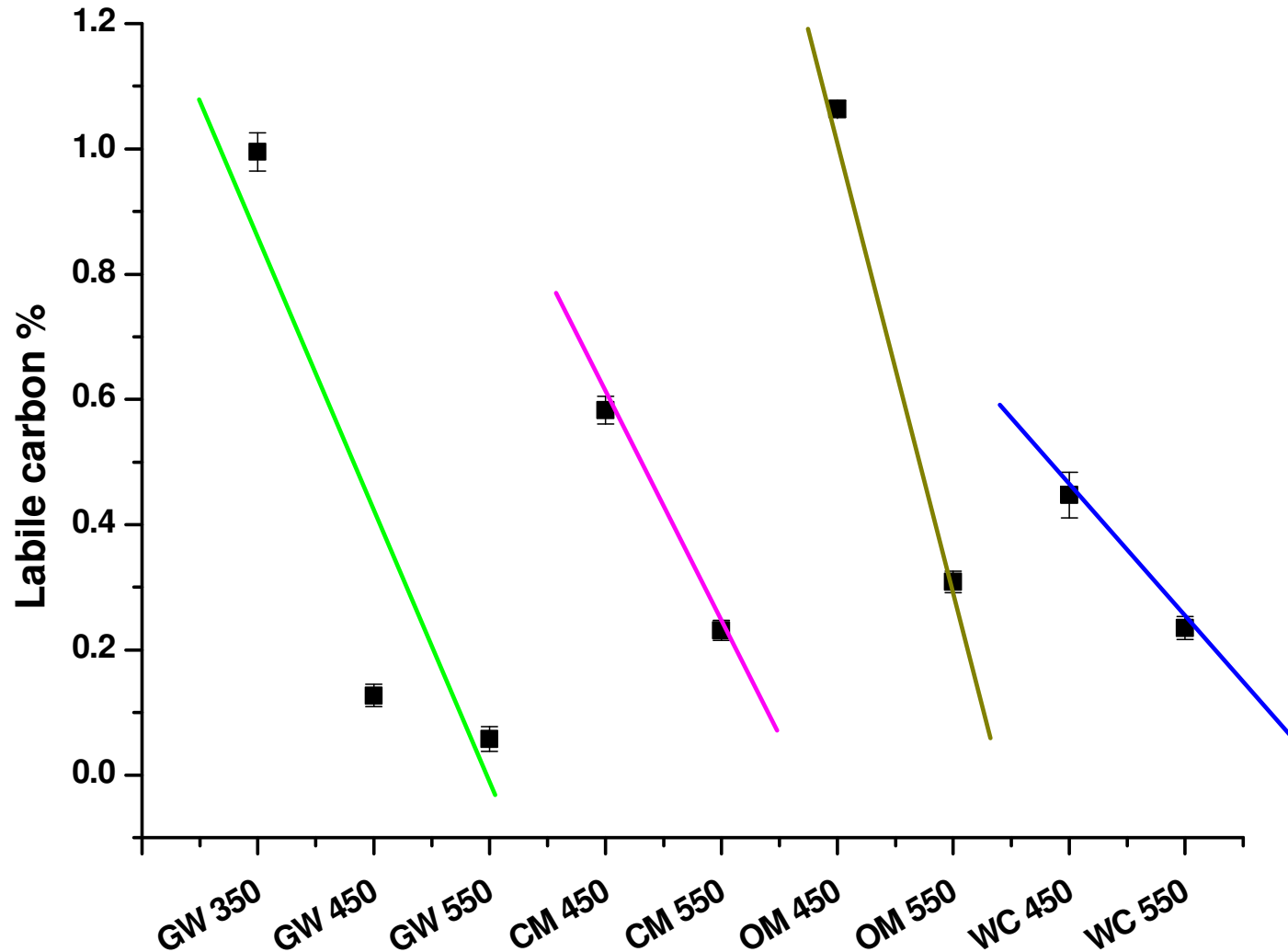
Sample preparation; Py-GC-MS

- Mix
- Sub-sample
- Freeze dry
- Grind
- Sub-sample
- 3mg sample of biochar analysed

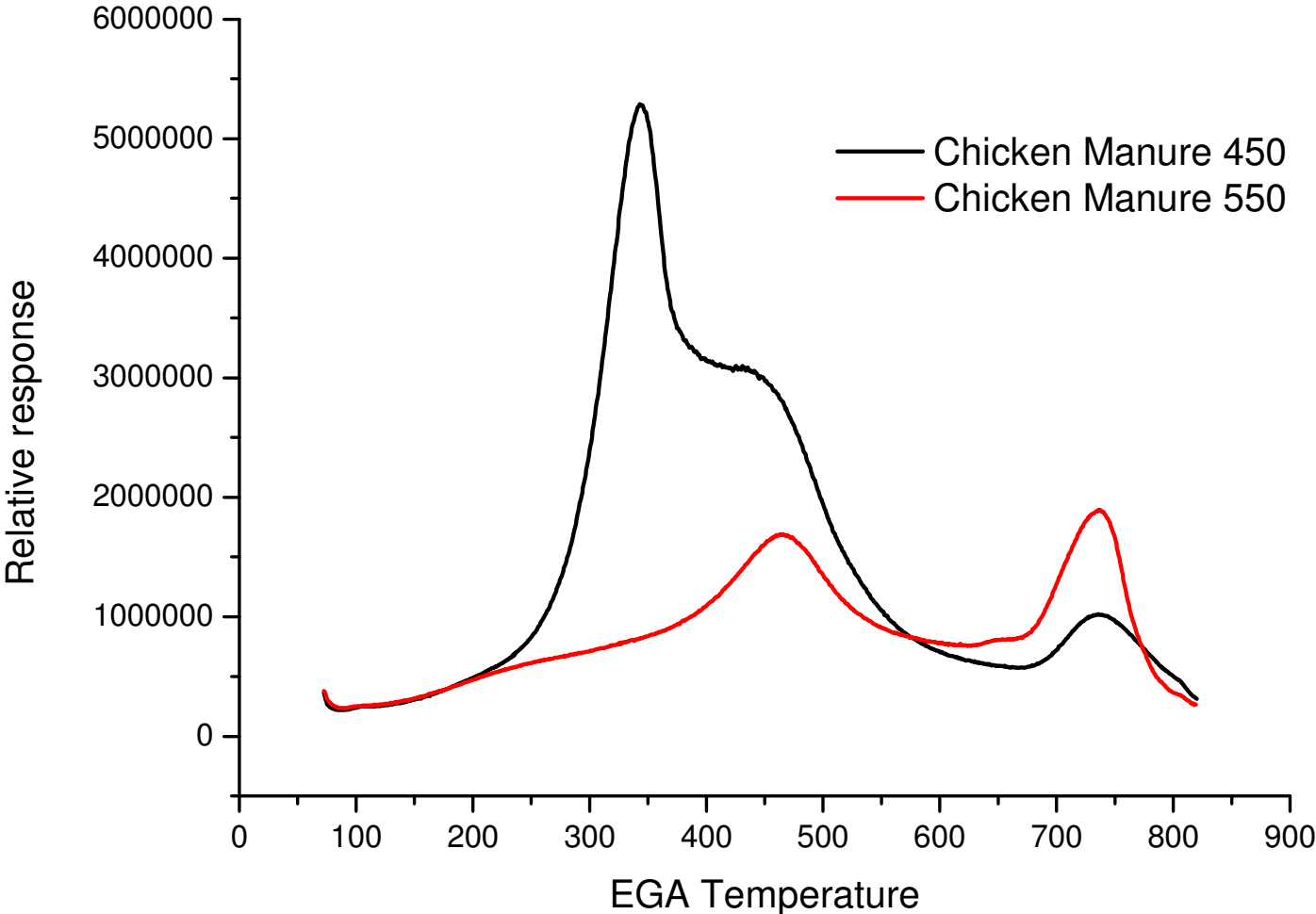
EGA



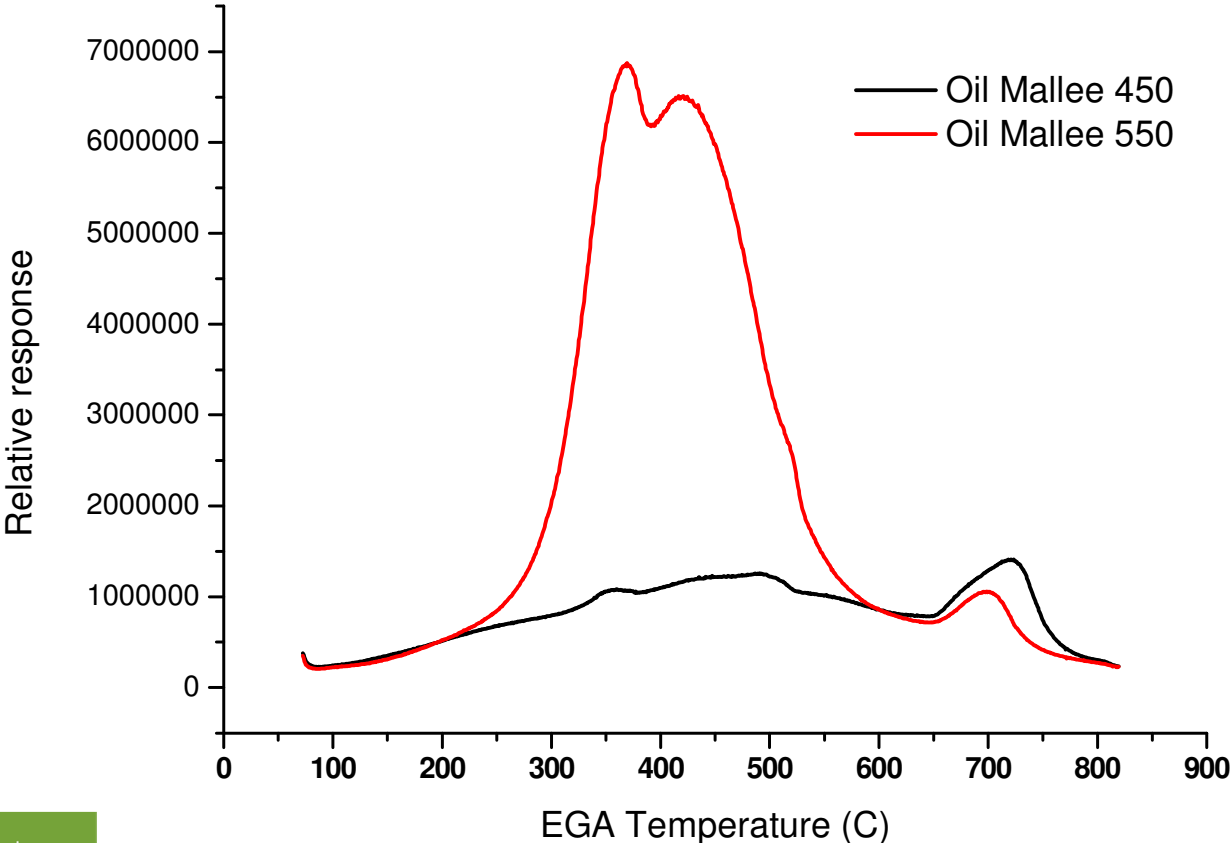
Labile carbon content of biochars (Incubation)



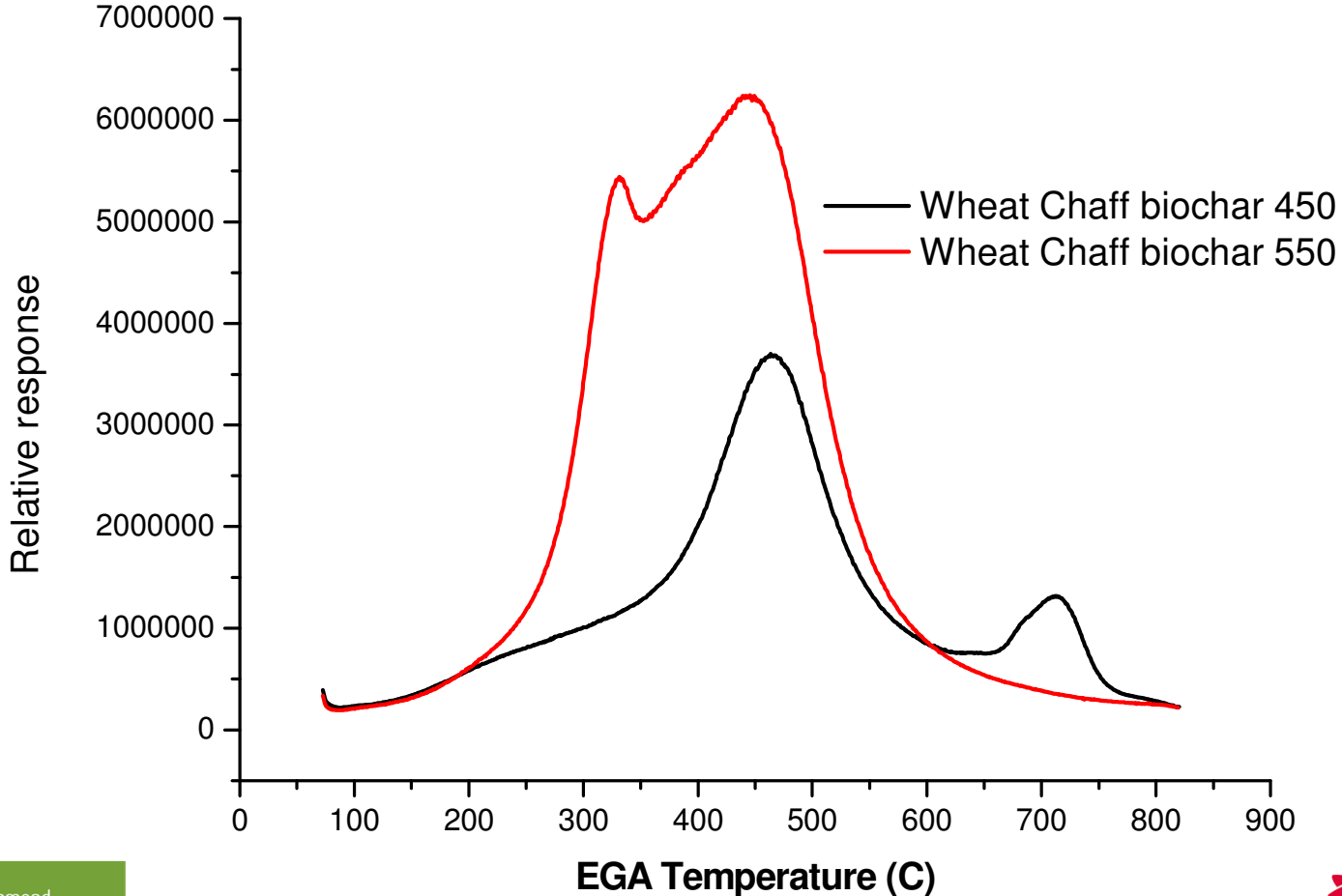
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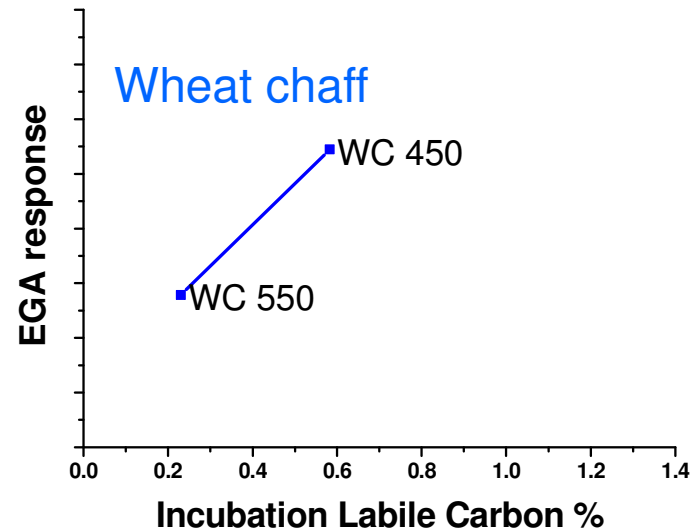
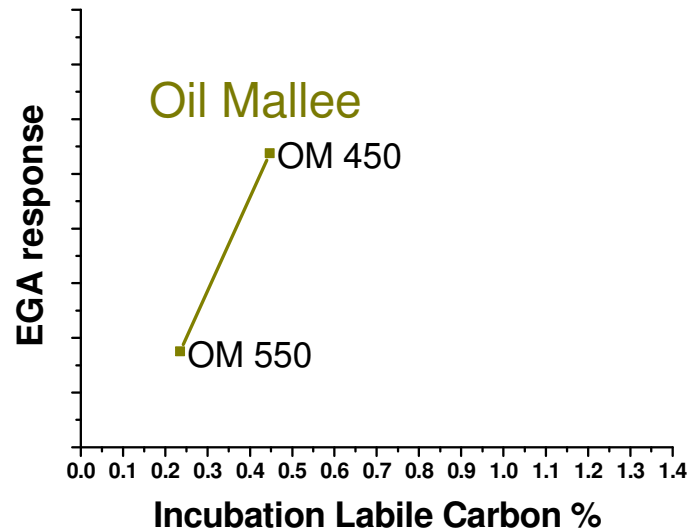
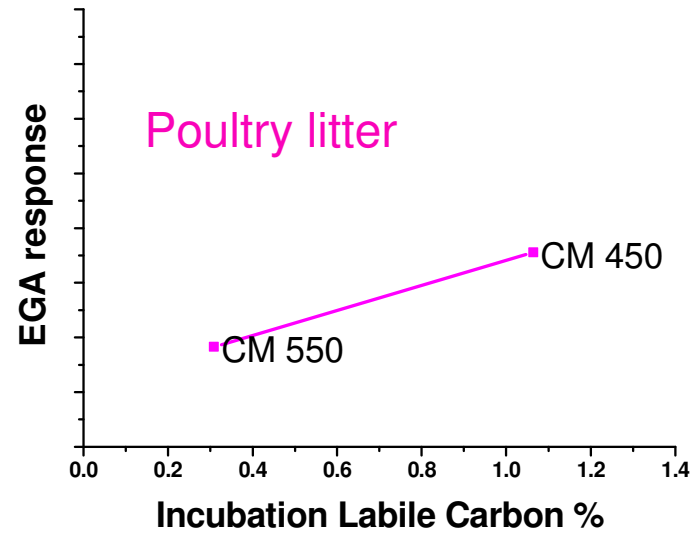
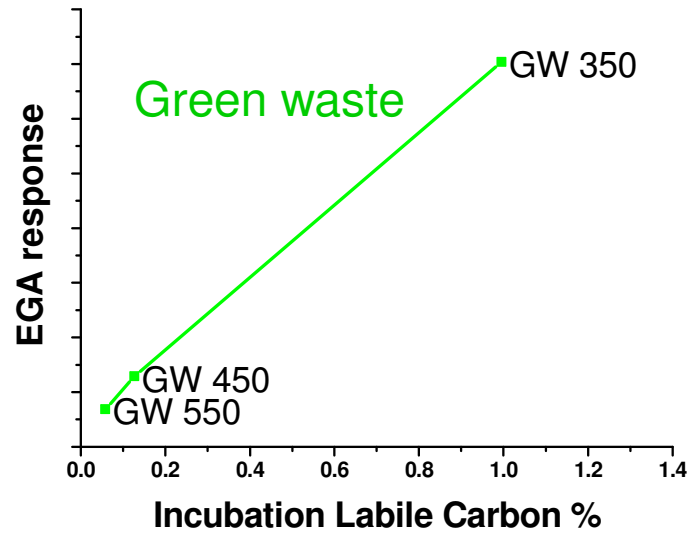
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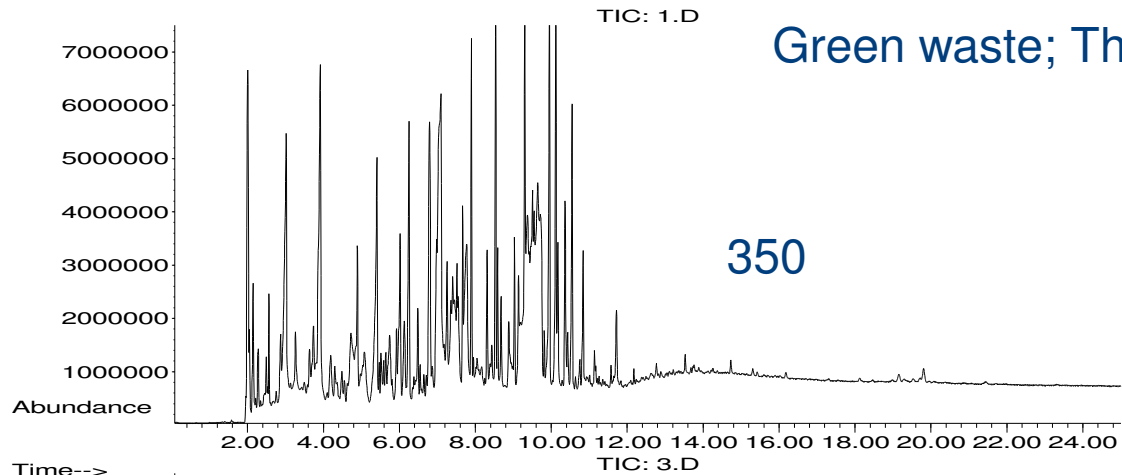
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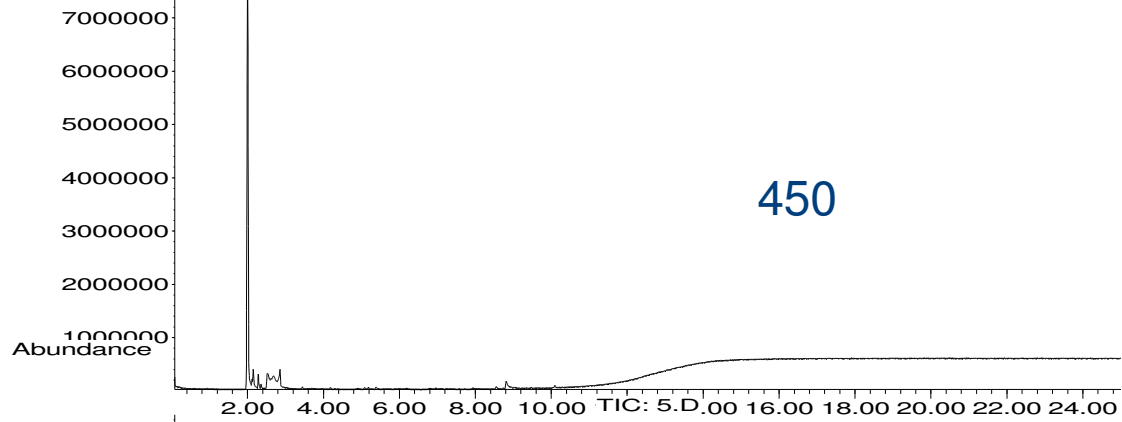
Labile C (incubation) vs Total response; EGA



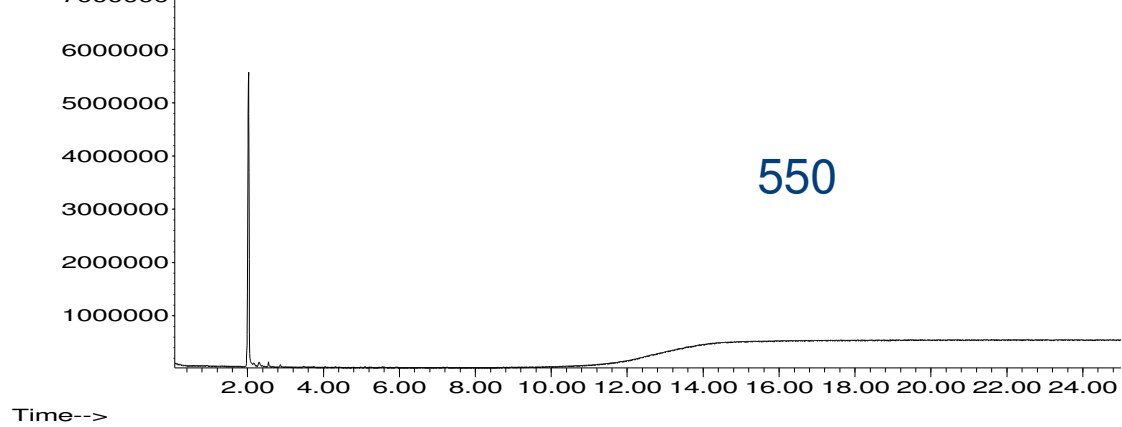
Abundance



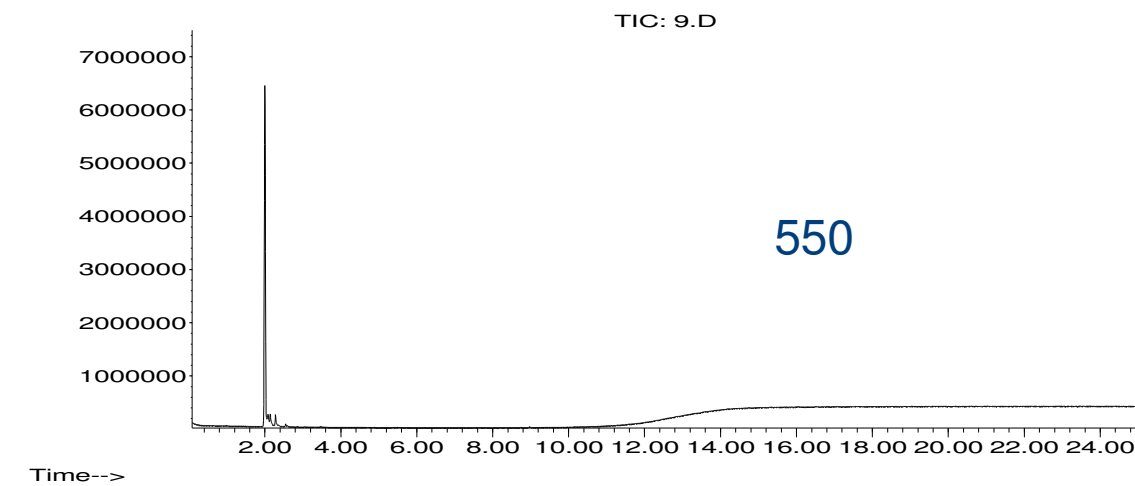
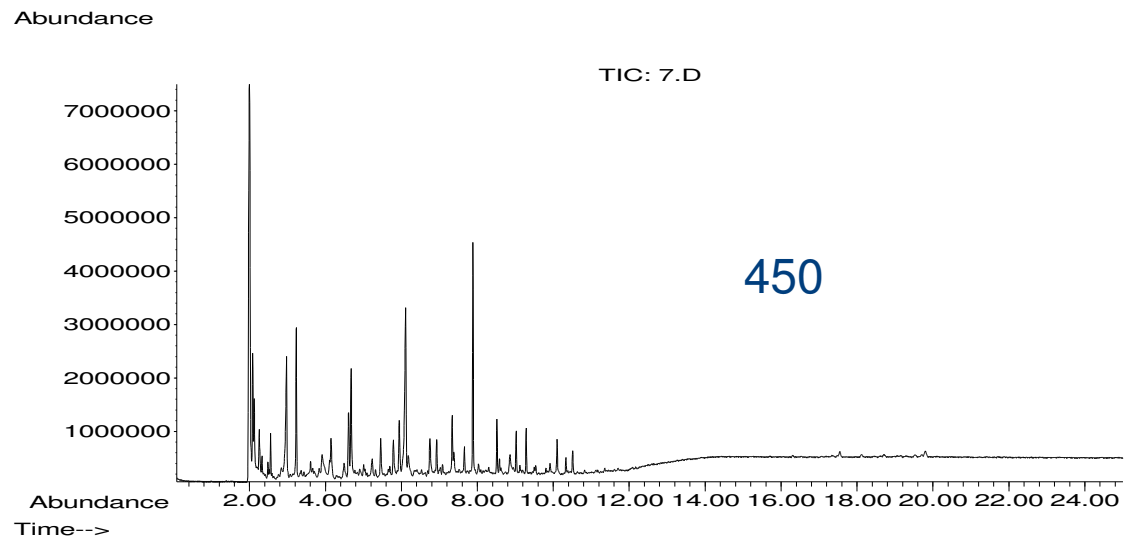
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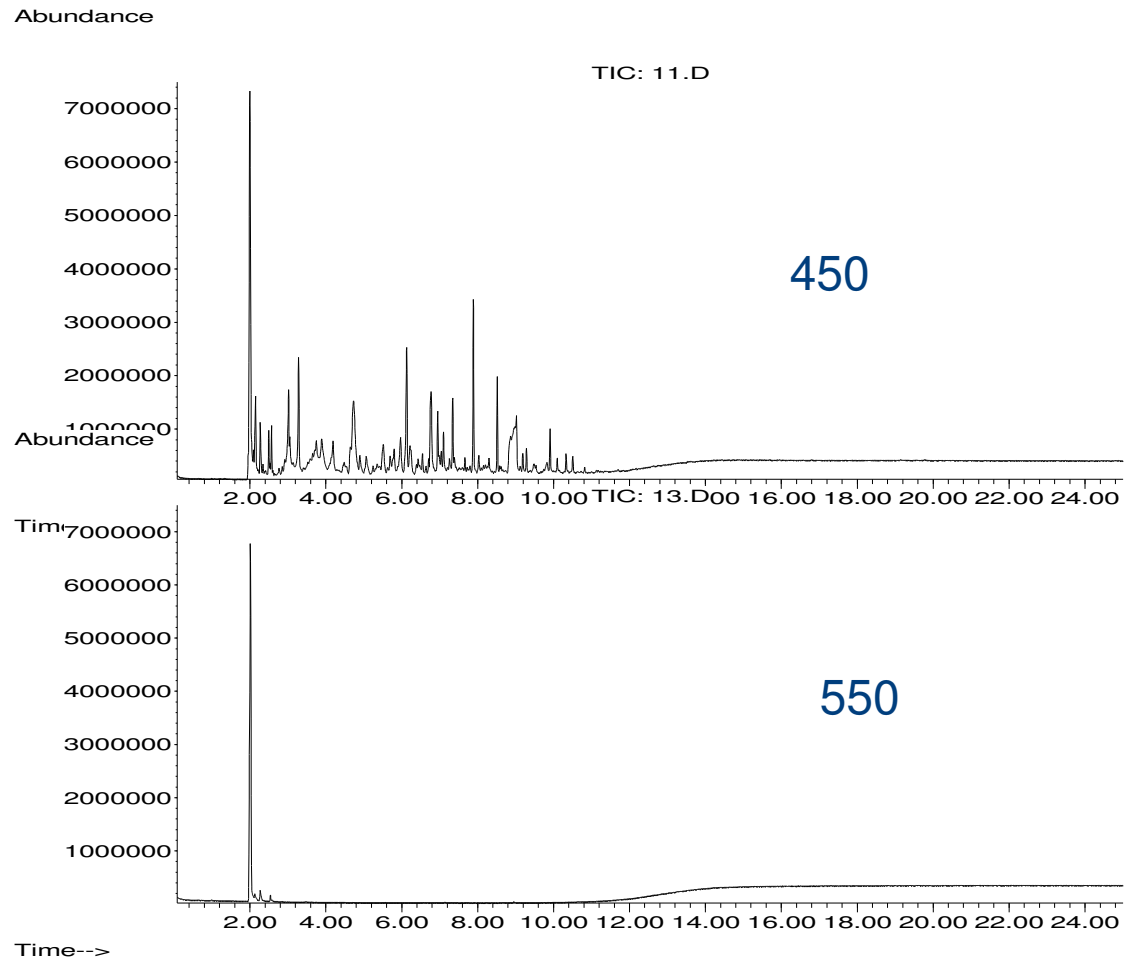
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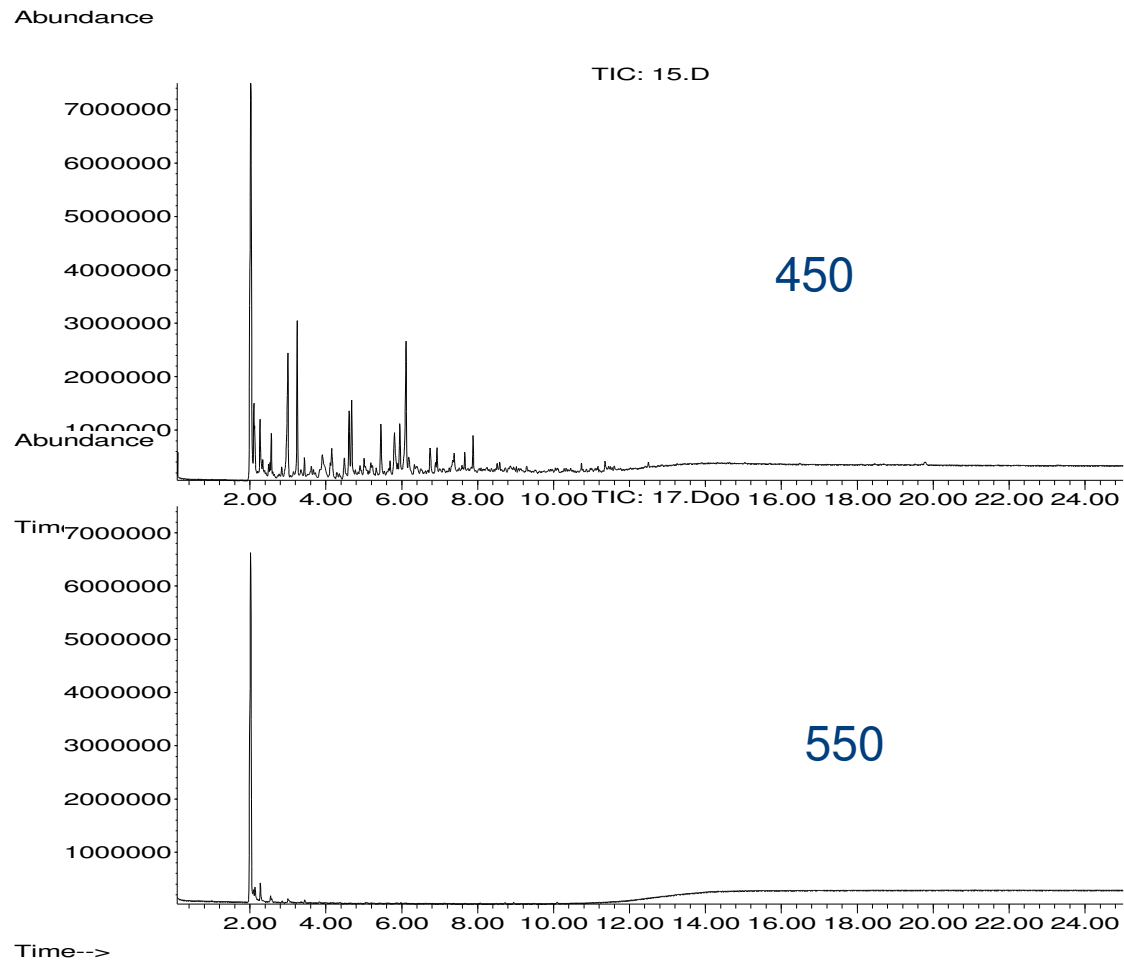
Chicken litter; Thermal desorption



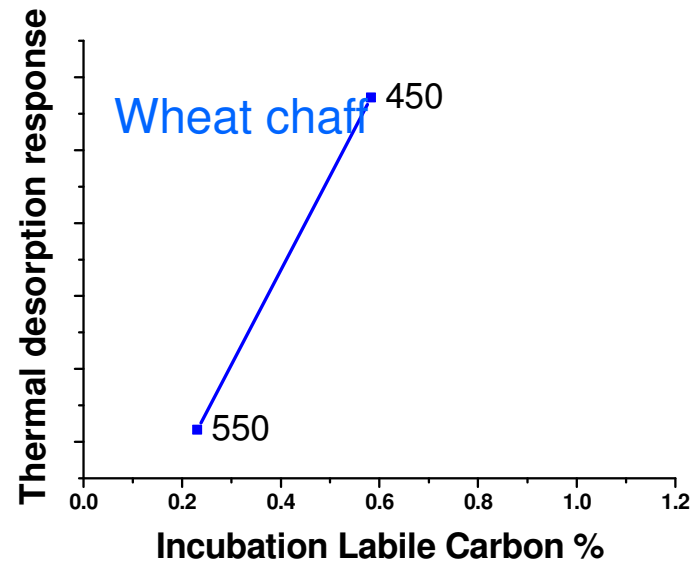
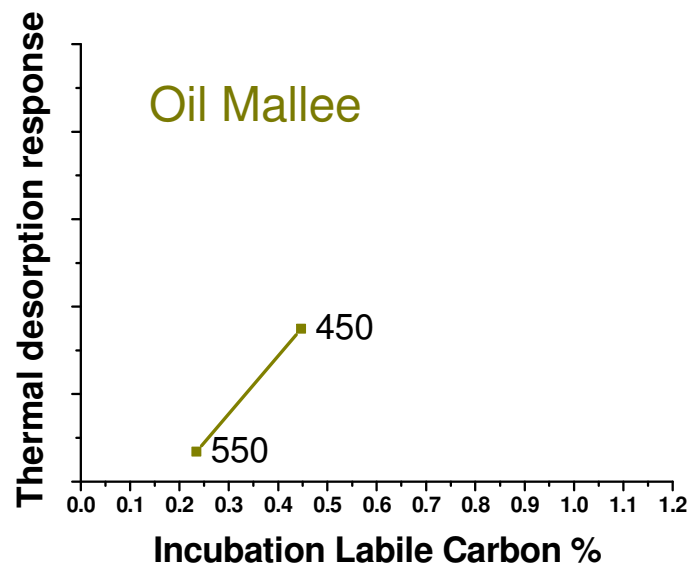
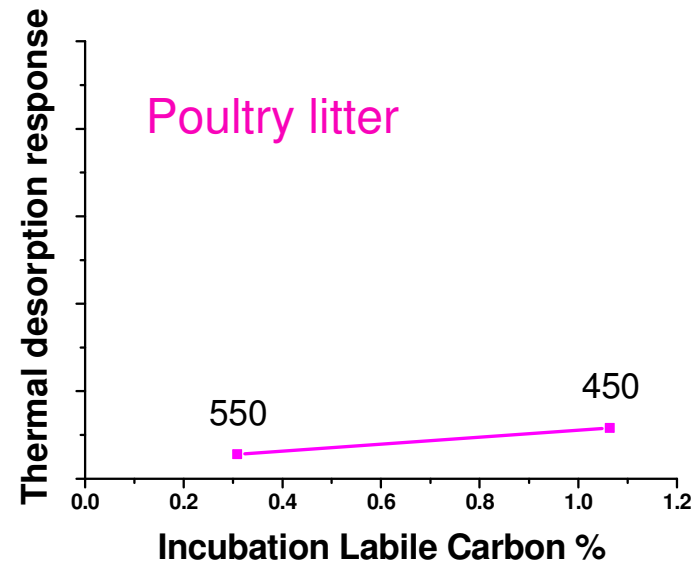
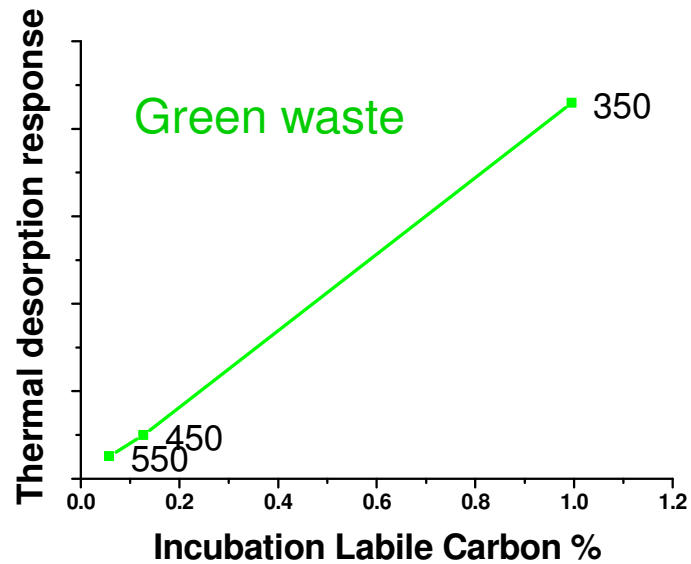
Oil Mallee; Thermal desorption



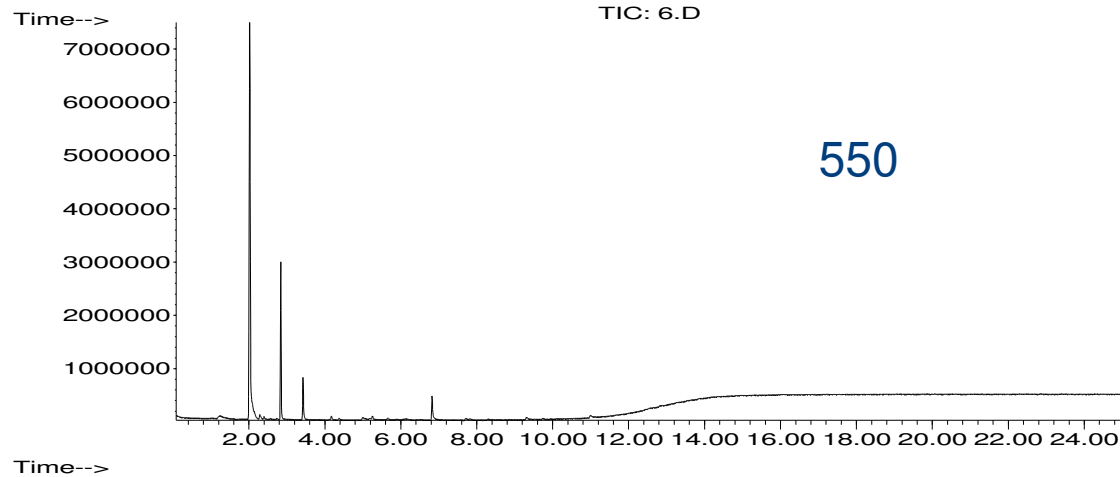
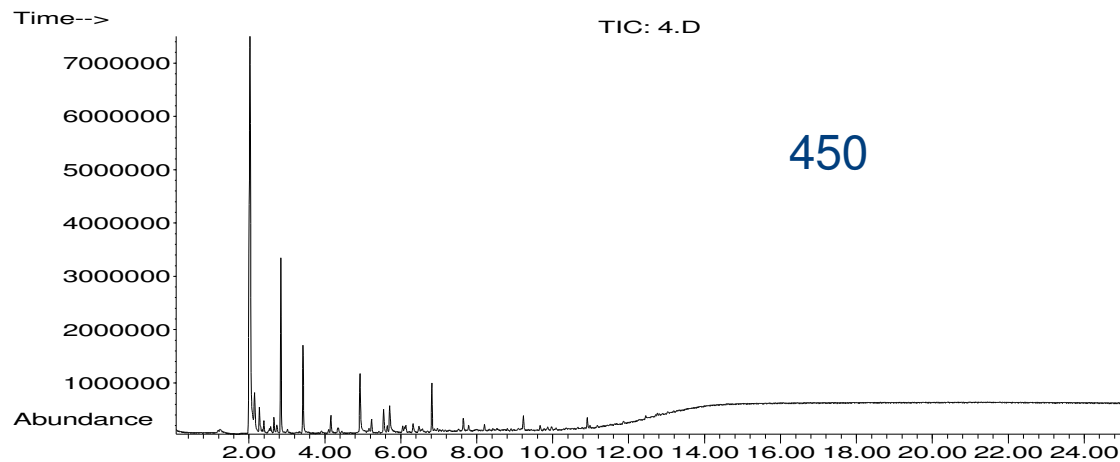
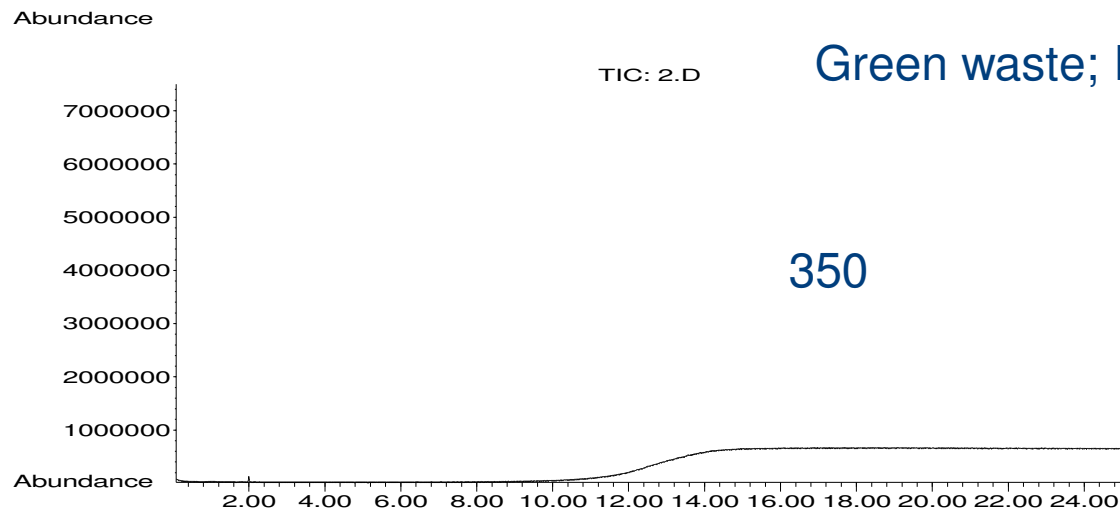
Wheat Chaff; Thermal desorption



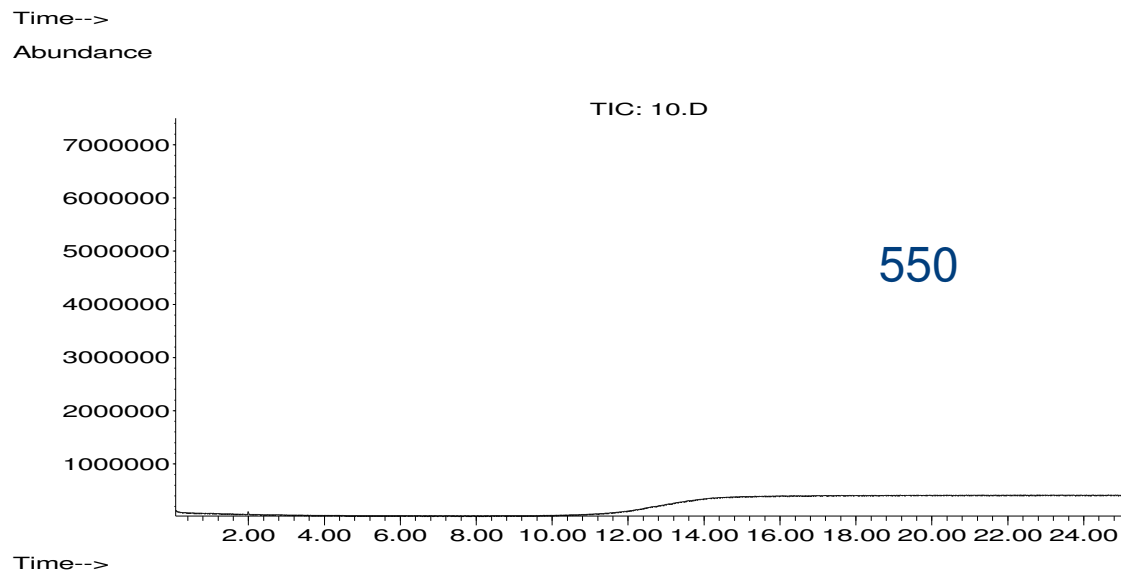
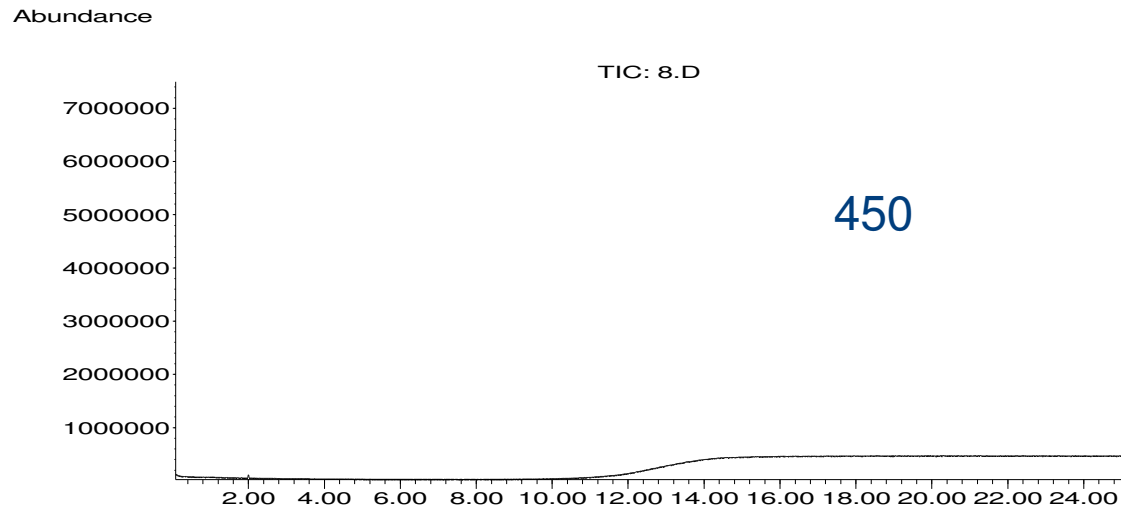
Labile C vs Total response; Thermal desorption



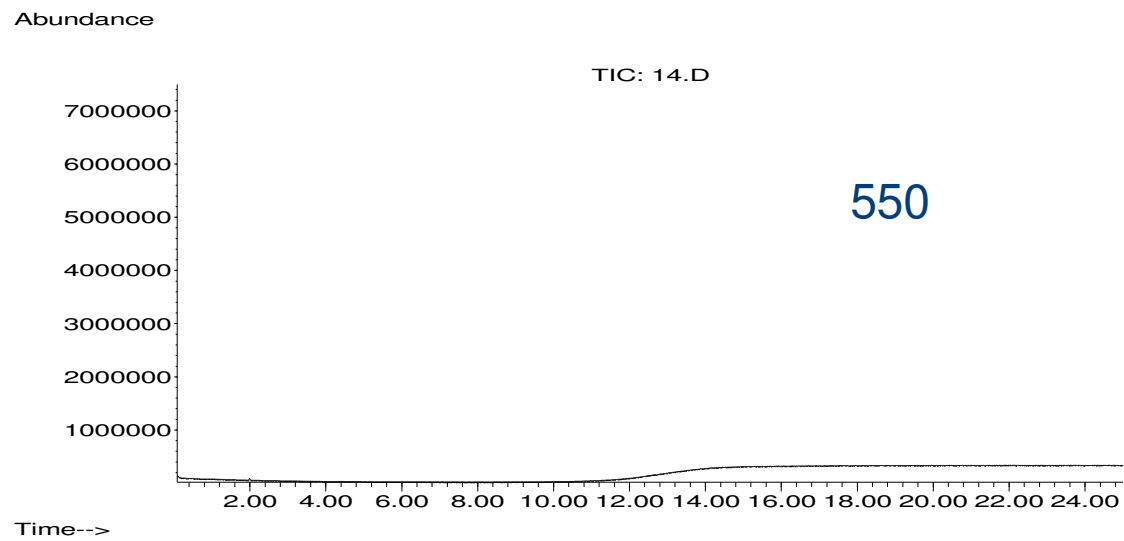
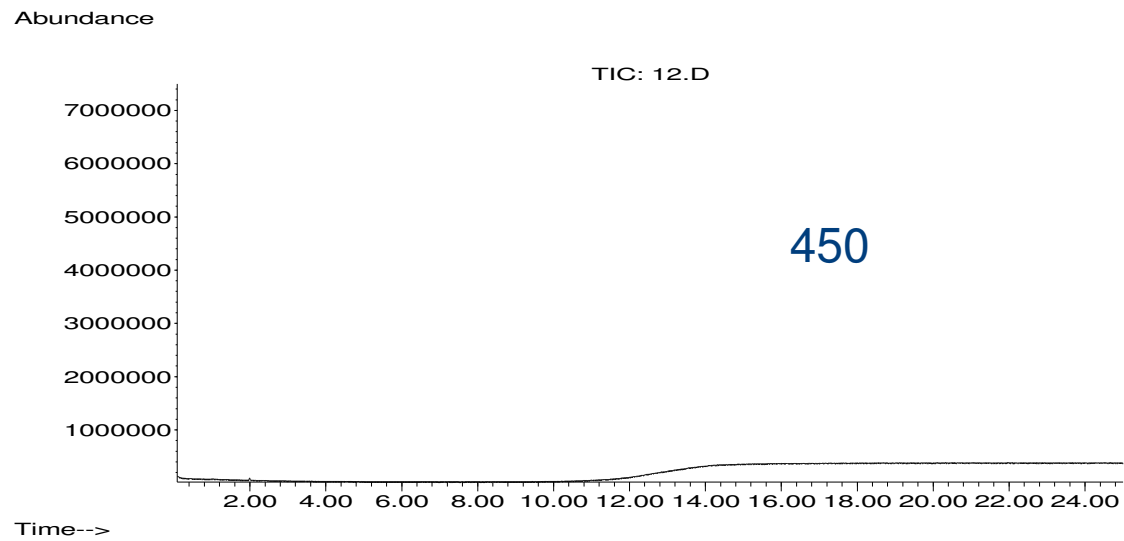
Green waste; Pyrolysis



Chicken litter; Pyrolysis



Oil mallee; Pyrolysis



Wheat chaff; Pyrolysis

