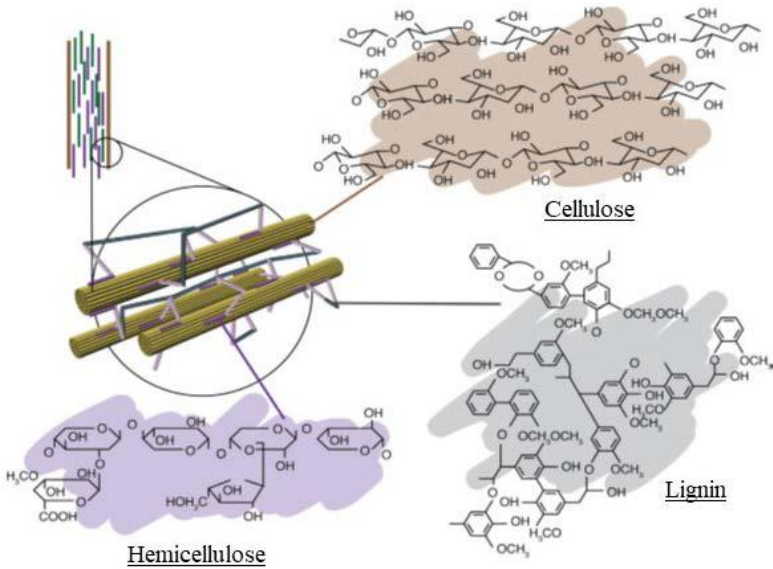


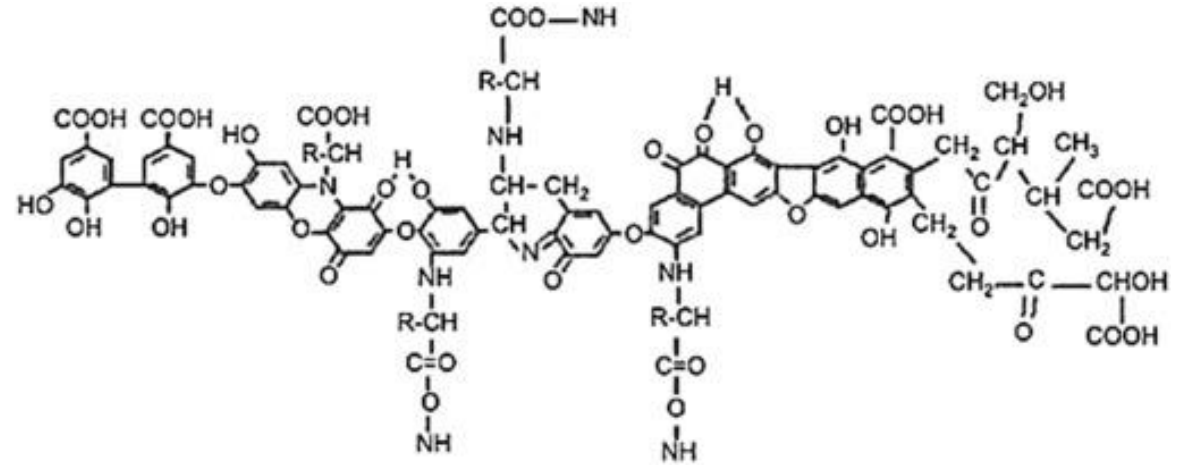
ANDRE FORBEHANDLINGSTEKNOLO GIER FOR BIOMASSER TIL VÆKSTSUBSTRATER



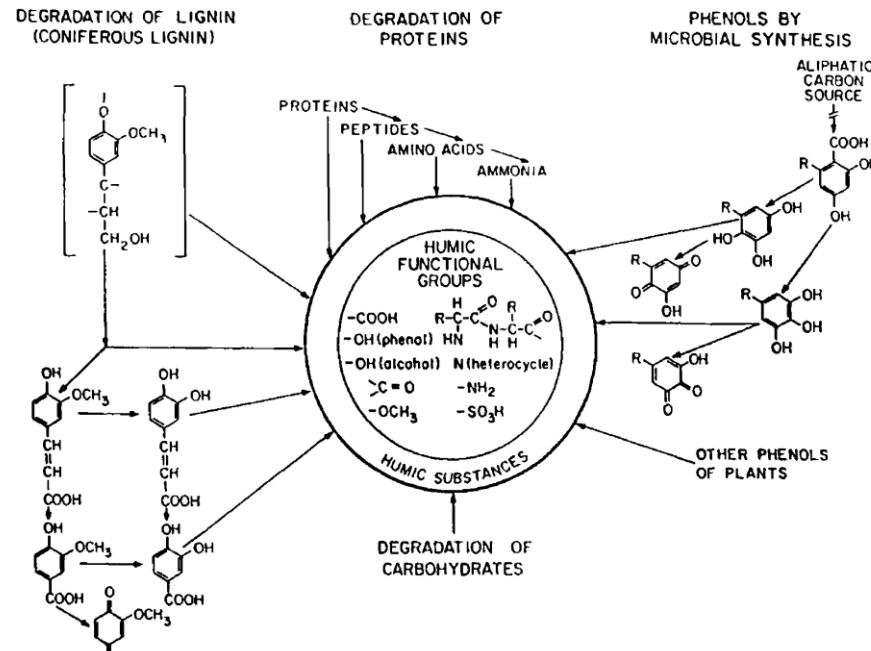
WHAT DOES NATURE DO?



Lignocellulosic biomass



humic material



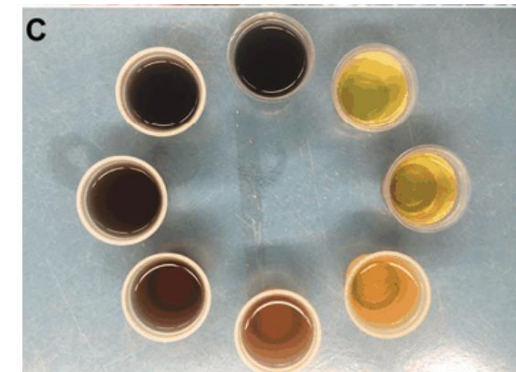
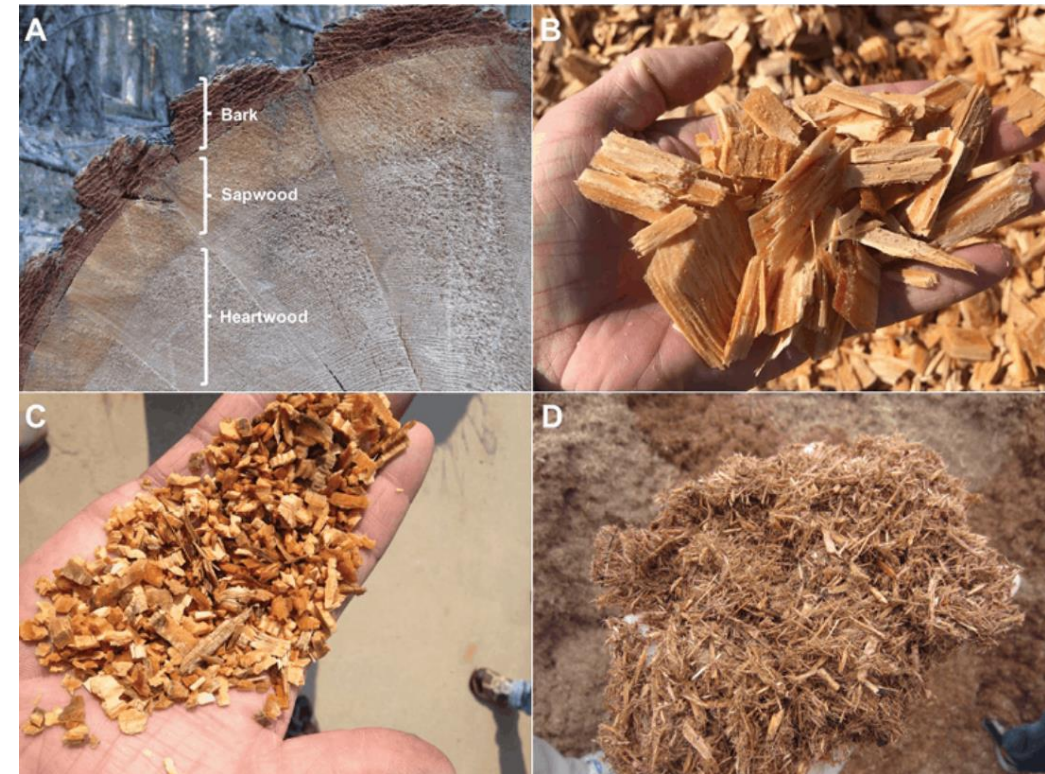
CAN WE AVOID HUMIFICATION?

Extrusion

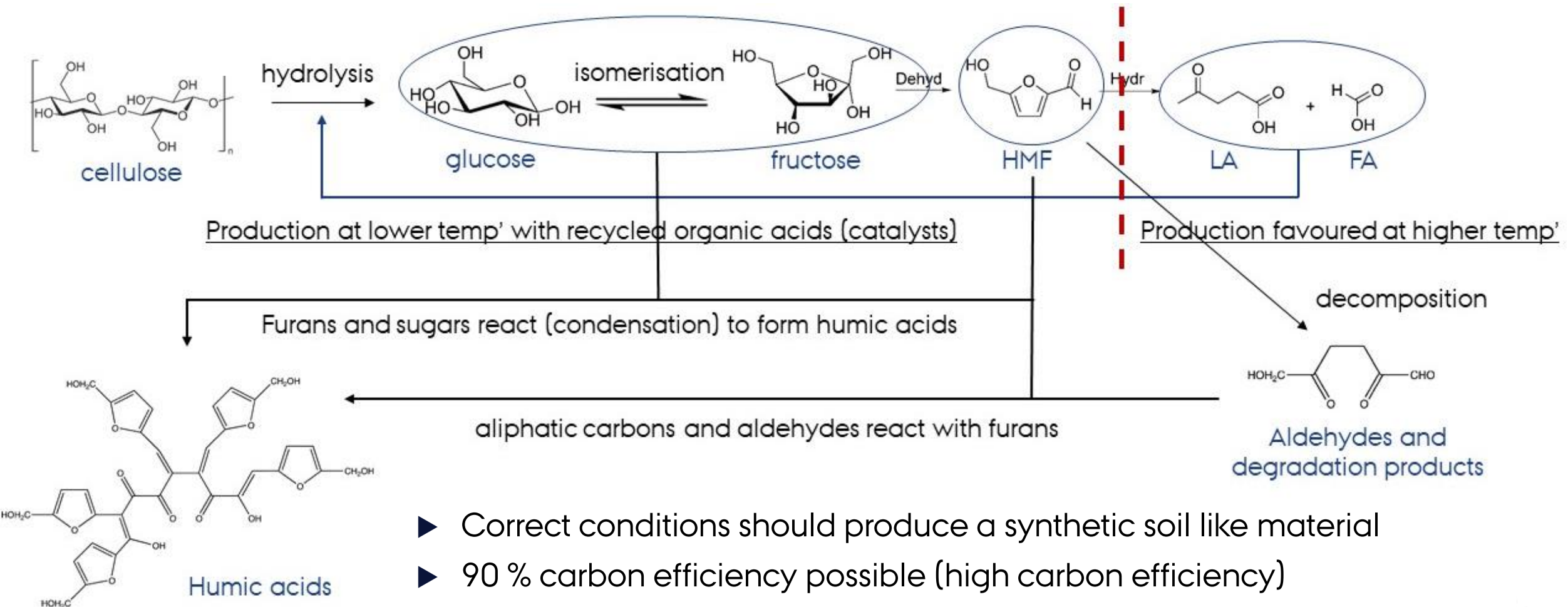
- Produces a nice structure for seedlings ✓
- Extruded stem wood performed poorly
 - Nitrogen drawdown
 - Cellulose = glucose.
 - Water + Sugar + nitrogen = microbe feast + toxins
 - Stem wood contains phytotoxic compounds
- Extruded bark performs well and nice structure ✓
 - Mostly lignin based – similar to peat
 - No programmed death / preservation unlike stem wood

Solutions

- Essential : additional N >100-400 mg/L mineral or organic N
- Ideal: composting / weathering (with mineral or organic N)
 - Allows degradation of phytotoxic toxins



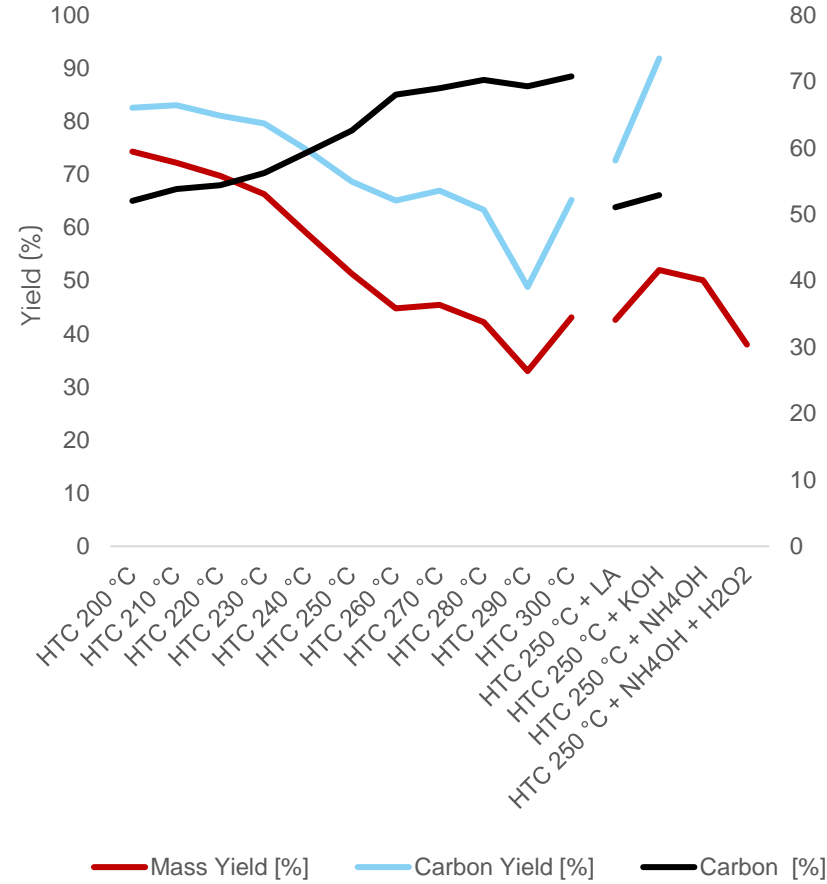
HYDROTHERMAL HUMIFICATION/ HTC



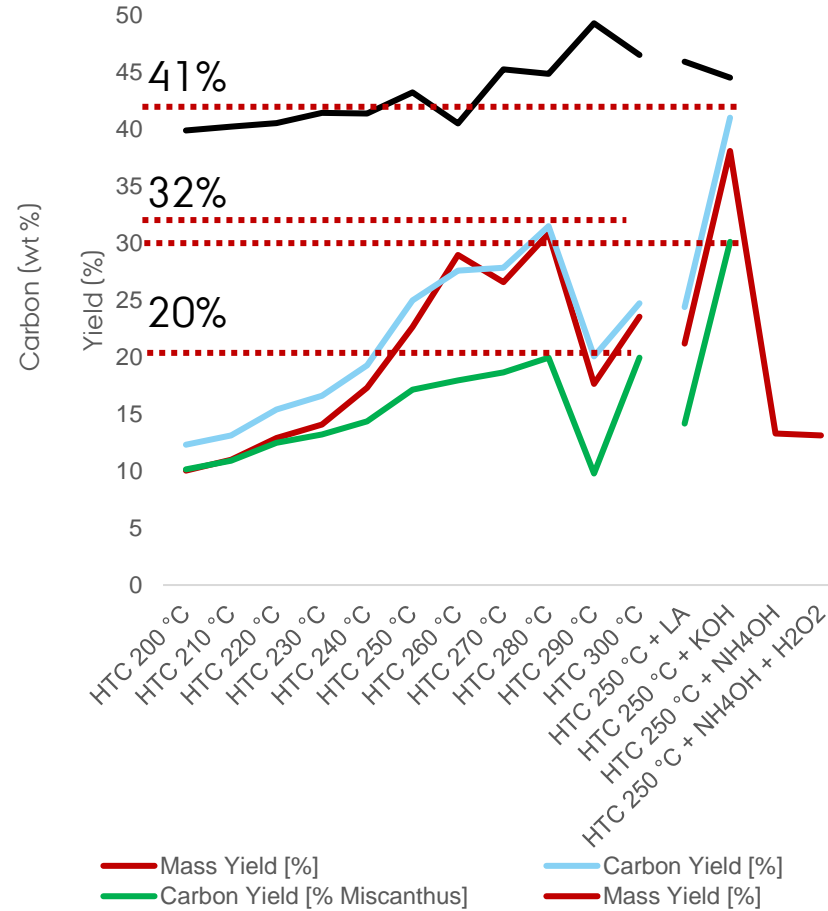
- ▶ Correct conditions should produce a synthetic soil like material
- ▶ 90 % carbon efficiency possible (high carbon efficiency)
- ▶ Regulatory framework in place as process has previously been applied to biochar (carbon sequestration)

TEMPERATURE AND CATALYSTS ON YIELDS

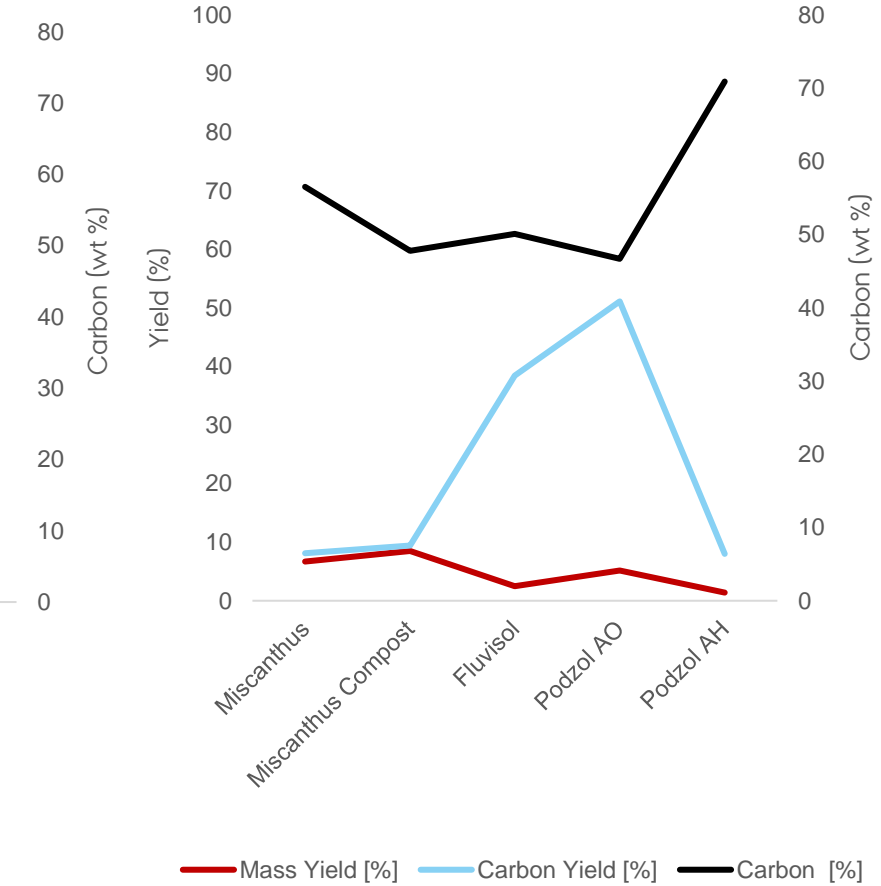
Hydrochars



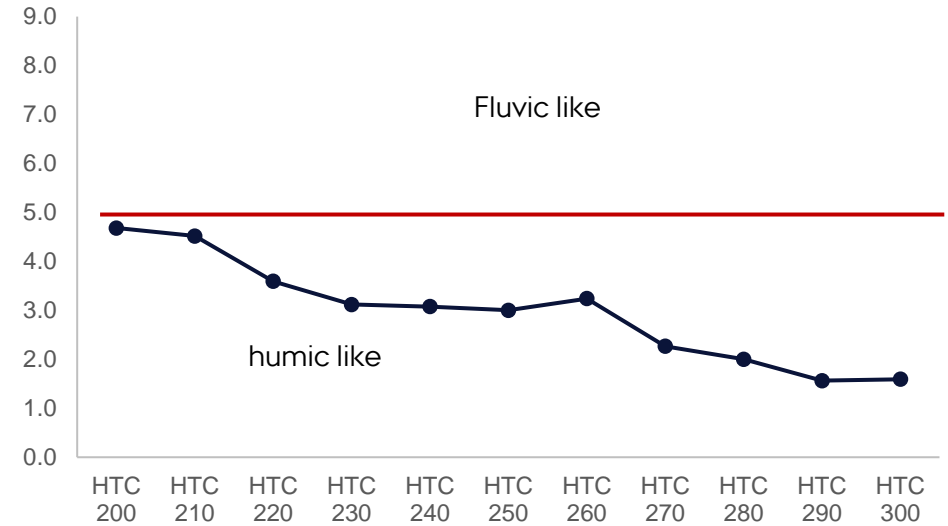
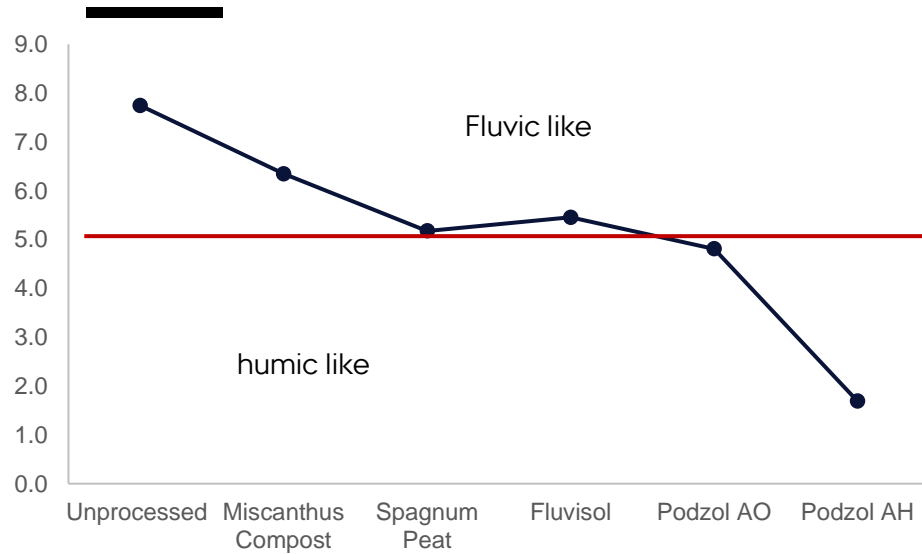
Humic Acids From Hydrochar



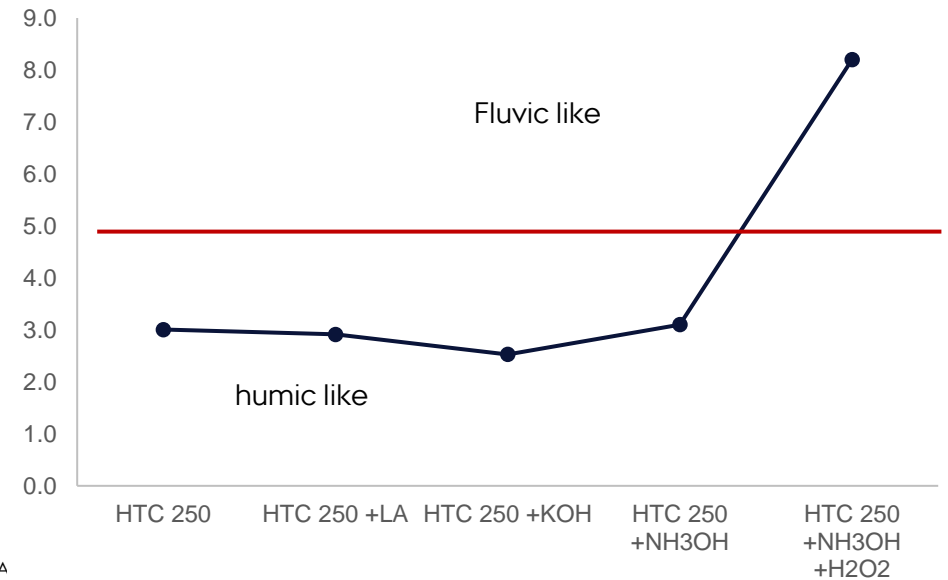
Humic Acids from Soils



AFFECT OF PROCESSING ON HA QUALITY

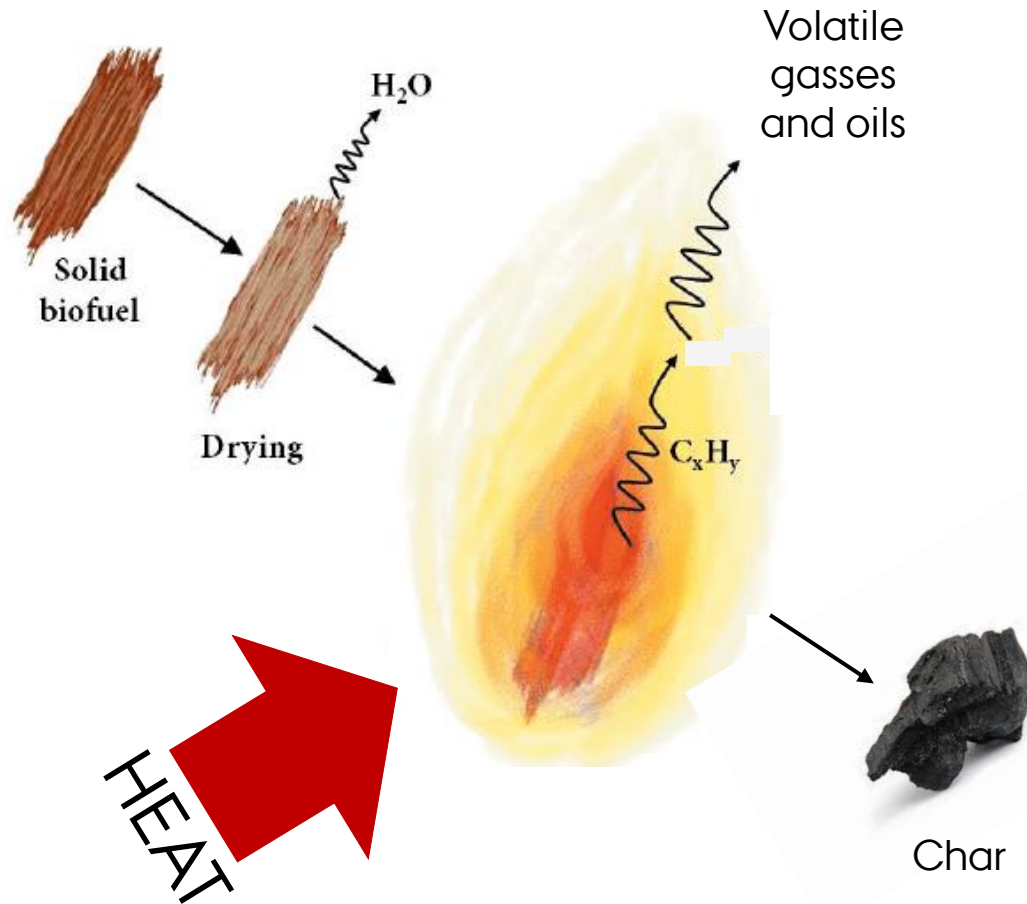


- E_4/E_6 ratio measure of humification
- > 5 its more likely still fluvic in nature
- < 5 its regarded as humic
- Lower the ratio = more humified
- More humified = less degradation
- Higher HTC temperature = more humified HA
- HTC chars = soil like



PYROLYSIS

Fuel + Heat → combustible volatiles (C_xH_y) + char (carbon)



- Initially outside scope but regularly suggested for soil
- Uses heat to thermally degrade cellulose
 - Cellulose lost as flammable volatiles
- Remaining biochar aromatic and resists degradation
 - No N drawdown
 - Porous structure should retain water and nutrients
- Relatively cheap commercially available technology
 - Quick – takes hours as opposed to 6 weeks for composting!
- Alkali – work would be required to make acid