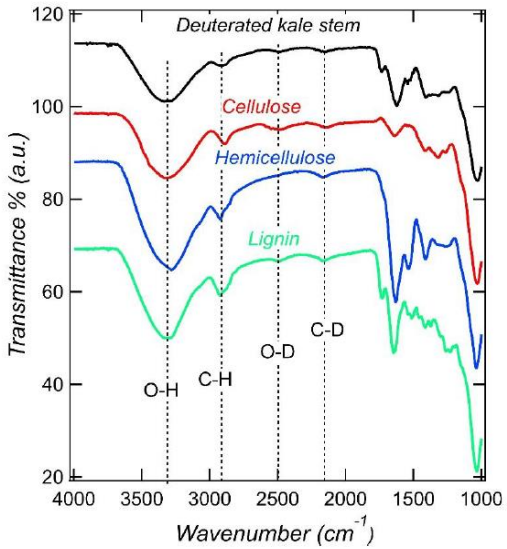
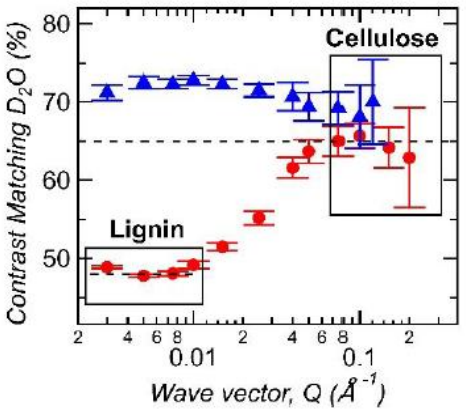
Differential deuteration in *Brassica* plants grown in 31% D_2O enables analysis of cell wall polymers with CV-SANS





Left: FTIR spectra show D labeling of deuterated kale stem and its cellulose, hemicellulose, and lignin extracts. Right: D_2O Contrast matching SANS reveals structural features of the component polymers of 31% deuterated kale stem (red dot) and its extracted cellulose (blue triangle)

Z. Yang, S. Bhagia, H.M. O'Neill, B. R. Evans, A. Ragauskas, B.H. Davison, S. V. Pingali, ACS Sust Chem Eng, 2023 (accepted).

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Scientific Achievement

Deuterium (D) substitution in cellulose, hemicellulose, and lignin isolated from commercially obtained *Brassica oleracea* (kale) grown in 31% D_2O wanalyzed with FTIR to enable structural resolution of cell wall components of whole stems by small-angle neutron scattering (SANS) with contrast variation (CV).

Significance and Impact

Kale is a C3 plant and a close relative of bioenergy crops *B. napus* (rapeseed) and *B. carinata* (camelina) which provide both seed oils and biomass residues for biofuel production.

These results show that CV-SANS can be extended to examine molecular structures of many species of plants that have been previously grown in 15-30% D_2O for nutritional and metabolic tracing studies.

Research Details

- Component biopolymers isolated from kale grown in 31% D_2O.
- Fourier transform infra-red spectroscopy (FTIR) measured D incorporation in stems and in isolated biopolymers.
- Molecular structure of kale stems and isolated cellulose was analyzed using contrast variation SANS