

**Characteristic Photoprotective Molecules from the Sphagnum World: A Solution-Phase Ultrafast Study of Sphagnic Acid**

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**A. UV-vis spectra of sphagnic acid**

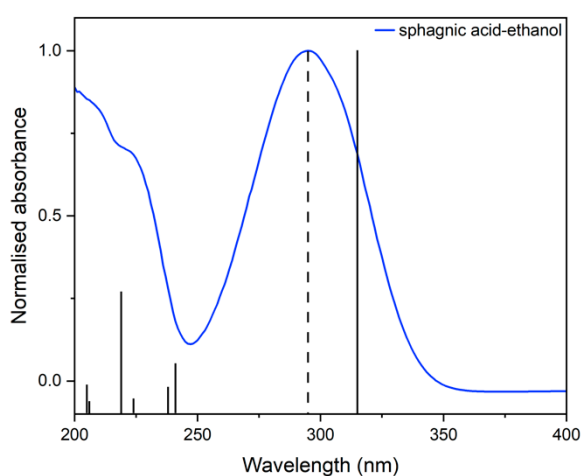


Figure S1: UV-vis spectrum of sphagnic acid in ethanol (obtained using a Cary 60 UV-vis spectrophotometer) (blue); dashed line shows pump wavelength selected for TEAS (295 nm); calculated vertical excitations for sphagnic acid (solid black), computed using B3LYP functional in combination with cc-PVTZ basis set including implicit solvation by ethanol with the PCM model.

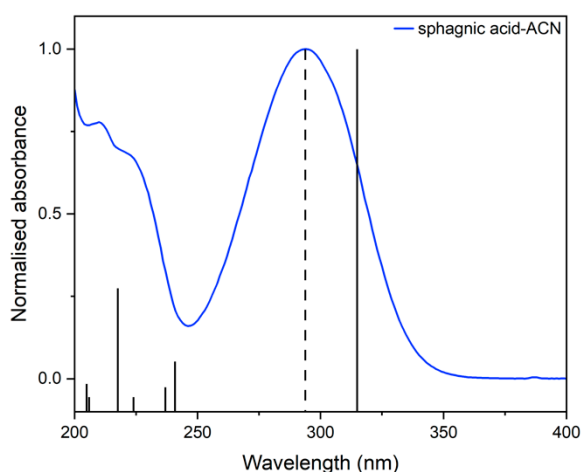


Figure S2: UV-vis spectrum of sphagnic acid in acetonitrile (obtained using a Cary 60 UV-vis spectrophotometer) (blue); dashed line shows pump wavelength selected for TEAS (294 nm); calculated vertical excitations for sphagnic acid (solid black), computed using B3LYP functional in combination with cc-PVTZ basis set including implicit solvation by acetonitrile with the PCM model.

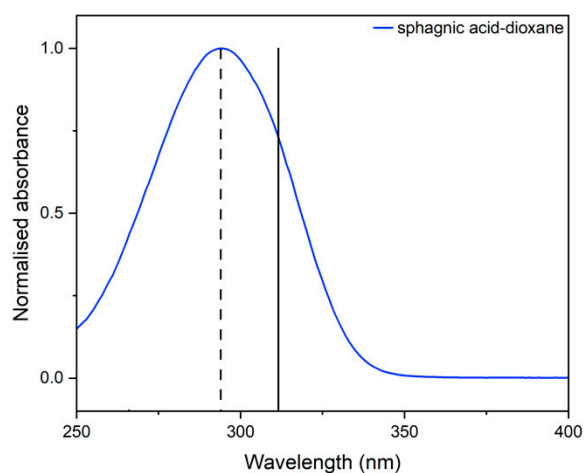


Figure S3: UV-vis spectrum of sphaginic acid in dioxane (obtained using a Cary 60 UV-vis spectrophotometer) (blue); dashed line shows pump wavelength selected for TEAS (294 nm); calculated vertical excitations for sphaginic acid (solid black), computed using B3LYP functional in combination with cc-PVTZ basis set including implicit solvation by dioxane with the PCM model.

## B. Residuals from fitting

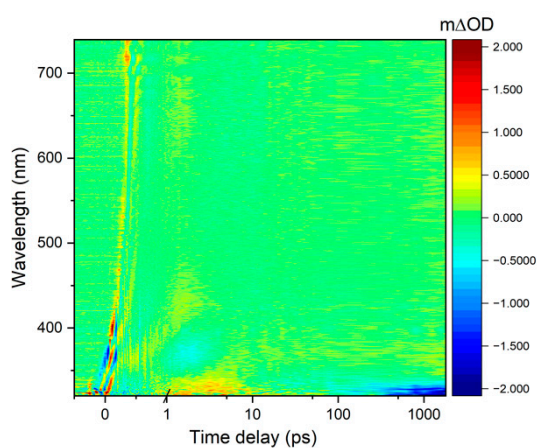


Figure S4: Residuals between Glotaran fits and non-chirp corrected experimental data for sphaginic acid in ethanol

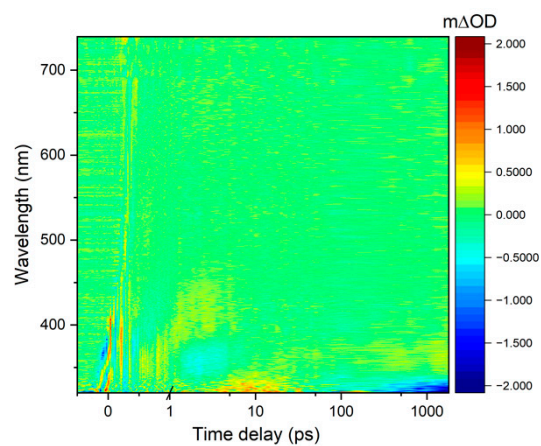


Figure S5: Residuals between Glotaran fits and non-chirp corrected experimental data for sphaginic acid in acetonitrile

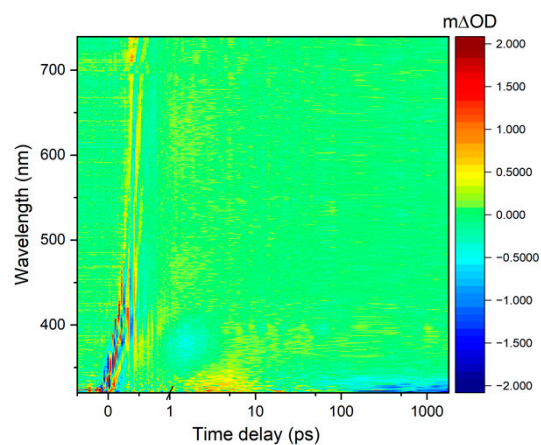


Figure S6: Residuals between Glotaran fits and non-chirp corrected experimental data for sphaginic acid in dioxane

### C. Transient absorption spectra of solvent alone

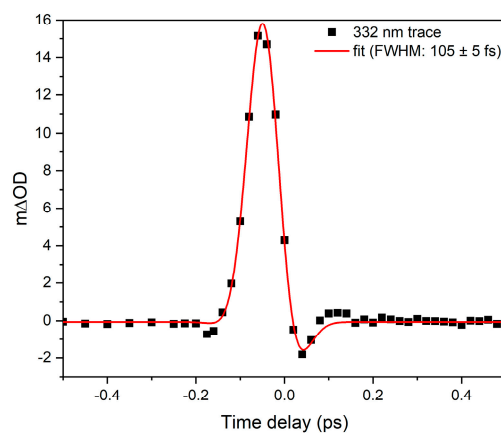


Figure S7: TAS trace at 332 nm of ethanol pumped at 295 nm and fitted with modified Gaussian to gauge instrument response

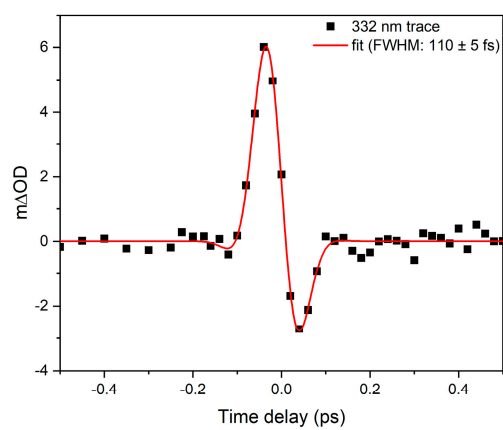


Figure S8: TAS trace at 332 nm of acetonitrile pumped at 294 nm with modified Gaussian fitting to gauge instrument response

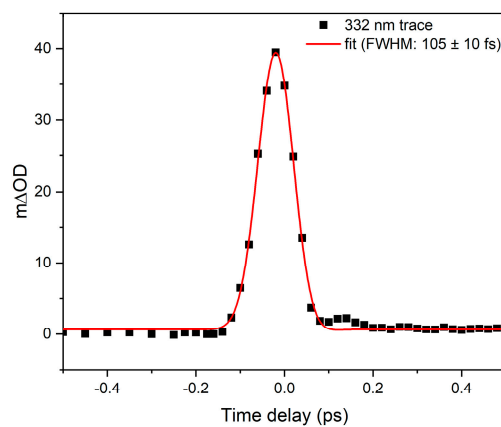


Figure S9: TAS trace at 332 nm of dioxane pumped at 294 nm with modified Gaussian fitting to gauge solvent response

## D. NMR

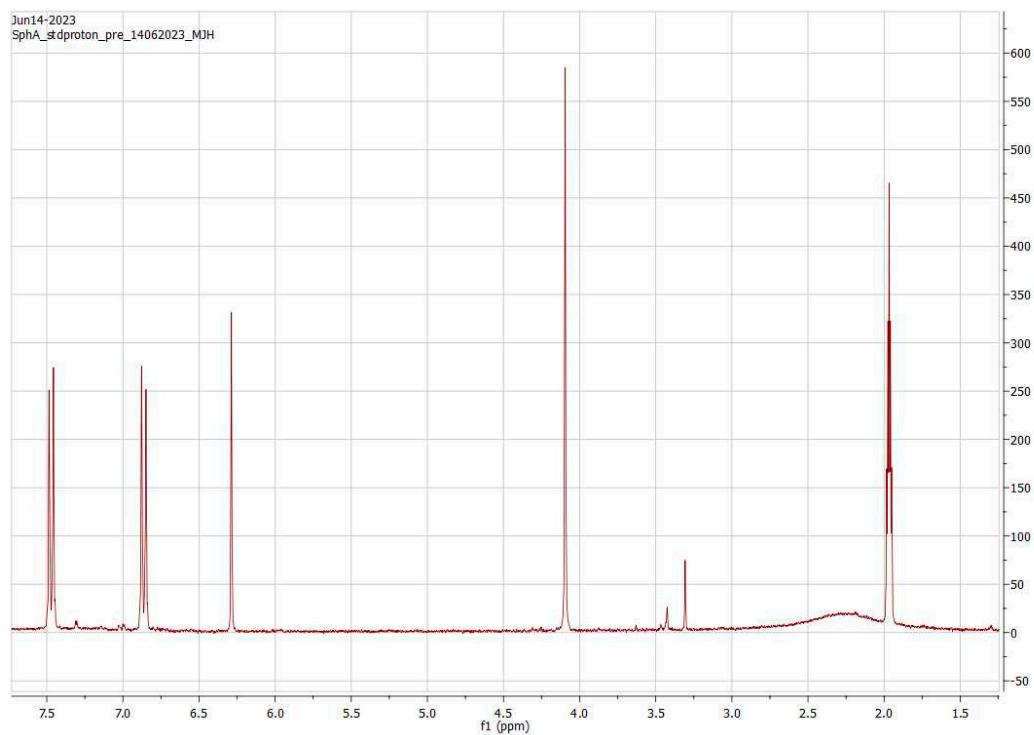


Figure S10: Standard  $^1\text{H}$  NMR of sphaginic acid in  $d_3$ -acetonitrile pre-irradiation with solar simulator

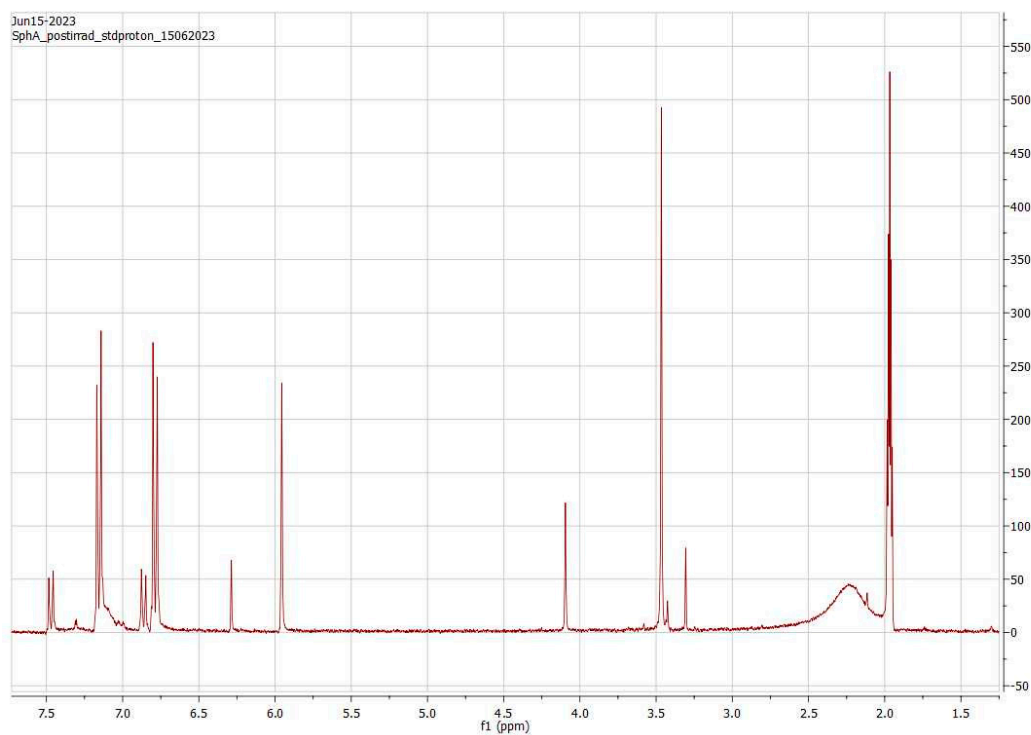


Figure S11: Standard  $^1\text{H}$  NMR of sphaginic acid in  $d_3$ -acetonitrile post-irradiation with solar simulator

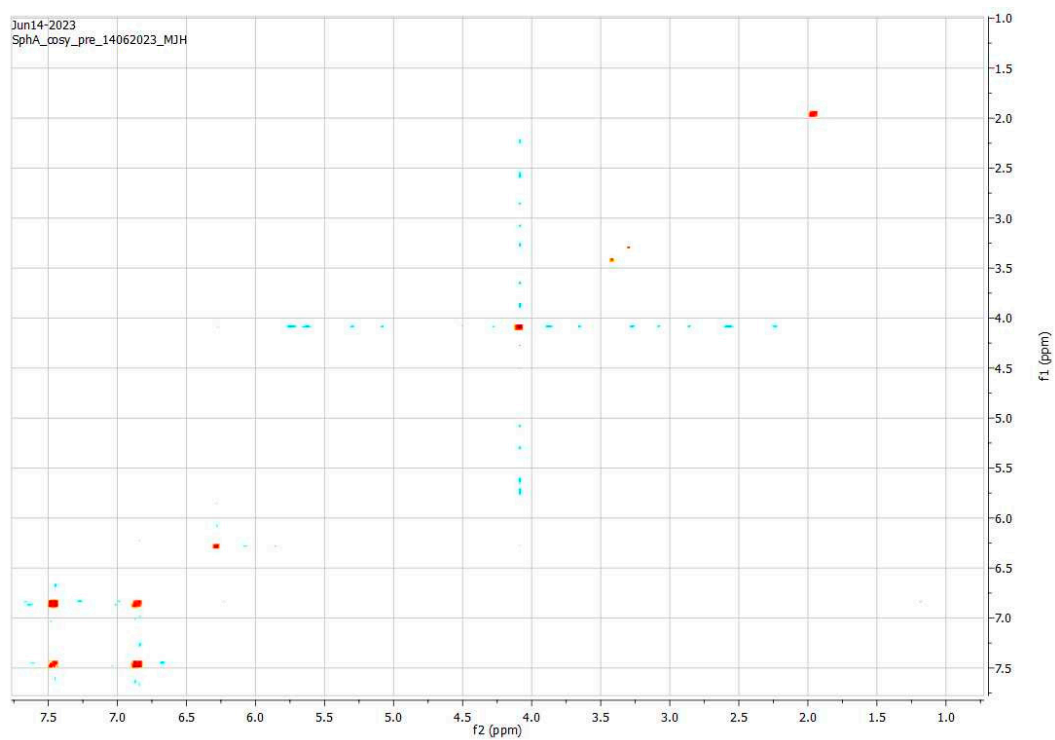


Figure S12:  $^1\text{H}$ - $^1\text{H}$  COSY NMR of sphaginic acid in  $d_3$ -acetonitrile pre-irradiation with solar simulator

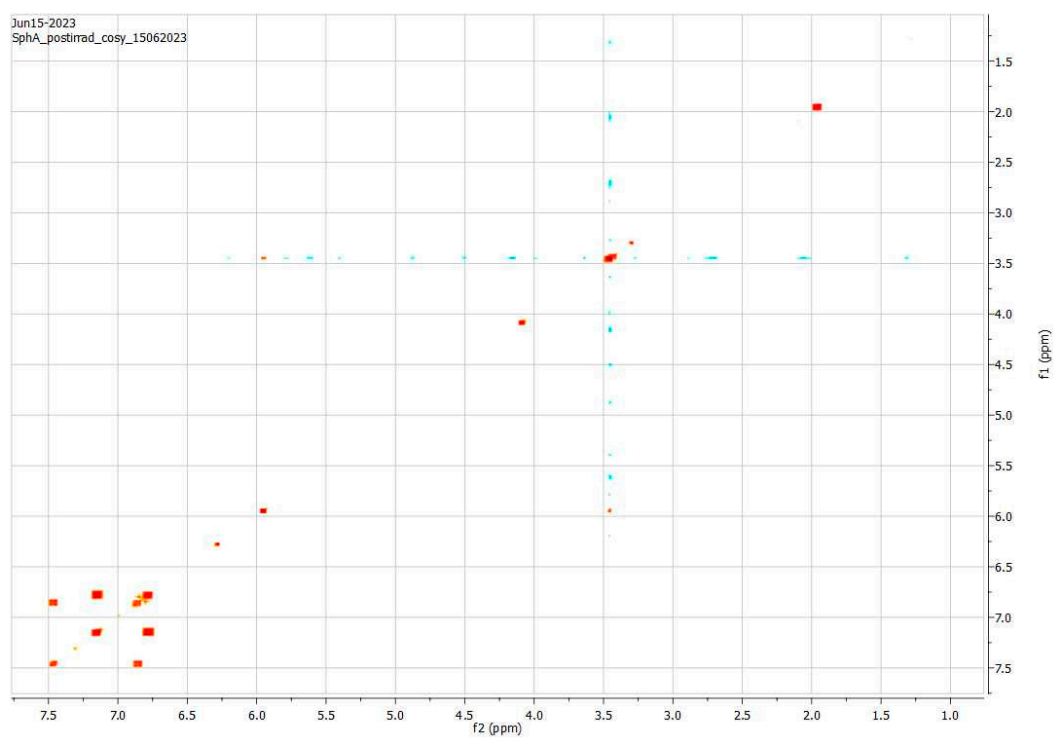


Figure S13:  $^1\text{H}$ - $^1\text{H}$  COSY NMR of sphaginic acid in  $d_3$ -acetonitrile post-irradiation with solar simulator

## E. Stability/photostability of sphaginic acid in solution

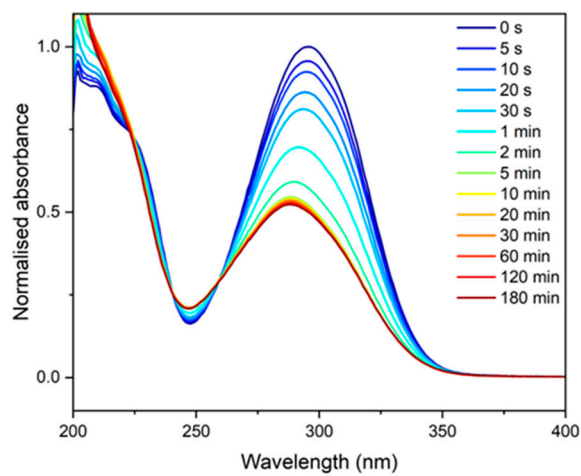


Figure S14: Normalised UV-vis spectra of sphaginic acid in ethanol taken after irradiation at various time intervals using a solar simulator

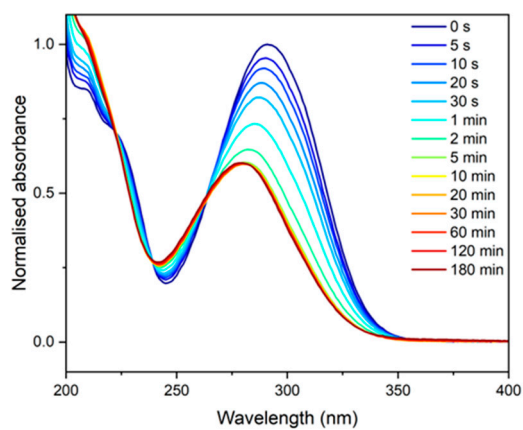
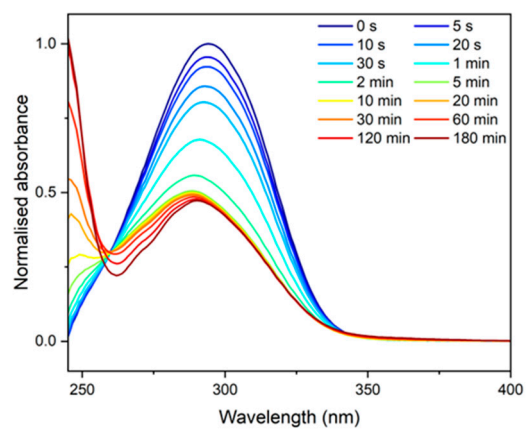


Figure S15: Normalised UV-vis spectra of sphaginic acid in acetonitrile taken after irradiation at various time intervals using a solar simulator



*Figure S16: Normalised UV-vis spectra of sphaginic acid in dioxane taken after irradiation at various time intervals using a solar simulator*