

*Supplementary materials for*

# **Combination Mechanism of Soil Dissolved Organic Matter and Cu<sup>2+</sup> in Vegetable Fields, Forests and Dry Farmland in Lujiang County**

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Table S1 Characterization of Dissolved Organic Matter by Spectral Analysis

Spectral parameter	Formula	Meaning of parameters
Fluorescence index (FI)	$E_x/E_m=370\text{nm}/450\text{nm}(500\text{nm})$	Sources of DOM (ca. 1.4 terrestrial sources dominate, ca. 1.9 microbial sources dominate)
Humification indicators (HIX)	$E_x/E_m=254\text{nm}/434\sim 480\text{nm}(300\sim 346\text{nm})$	Degree of DOM humification
Autochthonous index (BIX)	$E_x/E_m=310\text{nm}/380\text{nm}(430\text{nm})$	Relative contribution of DOM from biological activities at the site
SUVA <sub>254</sub>	$SUVA_{254}=A(254)/DOC$	Aromaticity of DOM
$E_{ET}/E_{Bz}$	$E_{ET}/E_{Bz}=253\text{nm}/220\text{nm}$	Types of substituents on DOM aromatic rings and the degree of substitution
$E_4/E_6$	$A(465)/A(665)$	Degree of polymerization of organic matter and degree of aromatization
$E_2/E_3$	$A(250)/A(365)$	Relative molecular weight size of organic matter

Note: Special UV absorbance (SUVA<sub>254</sub>) is the ratio of 254 nm ultraviolet absorbance to dissolved organic carbon (DOC) concentration.  $SUVA_{254} = UVA(254) / DOC$ .

$E_{ET}/E_{Bz}$  ratio: Solutions of 15 mg/L of OC were prepared in 10 mM sodium acetate (pH 7 fixed with acetic acid), and UV–visible spectra were recorded in the wavelength range of 200–700 nm. From these spectra, the ratio of absorbances at 253 (E<sub>253</sub>) and 220 (E<sub>220</sub>) nm, corresponding to the electron-transfer band (ET) and the benzenoid band (Bz) of benzene UV light absorption respectively, was calculated.

Table S2 Fluorescence spectral parameters of dissolved organic matter in soil of different agricultural land types

Soil type	Fluorescence index (FI)	Humification indicators (HIX)	Autochthonous index (BIX)
Dry farmland	$1.40 \pm 0.03$	$6.13 \pm 1.05$	$0.66 \pm 0.10$
Forest land	$1.25 \pm 0.12$	$9.75 \pm 0.58$	$0.91 \pm 0.08$
Vegetable fields	$1.39 \pm 0.07$	$6.82 \pm 0.87$	$0.81 \pm 0.15$

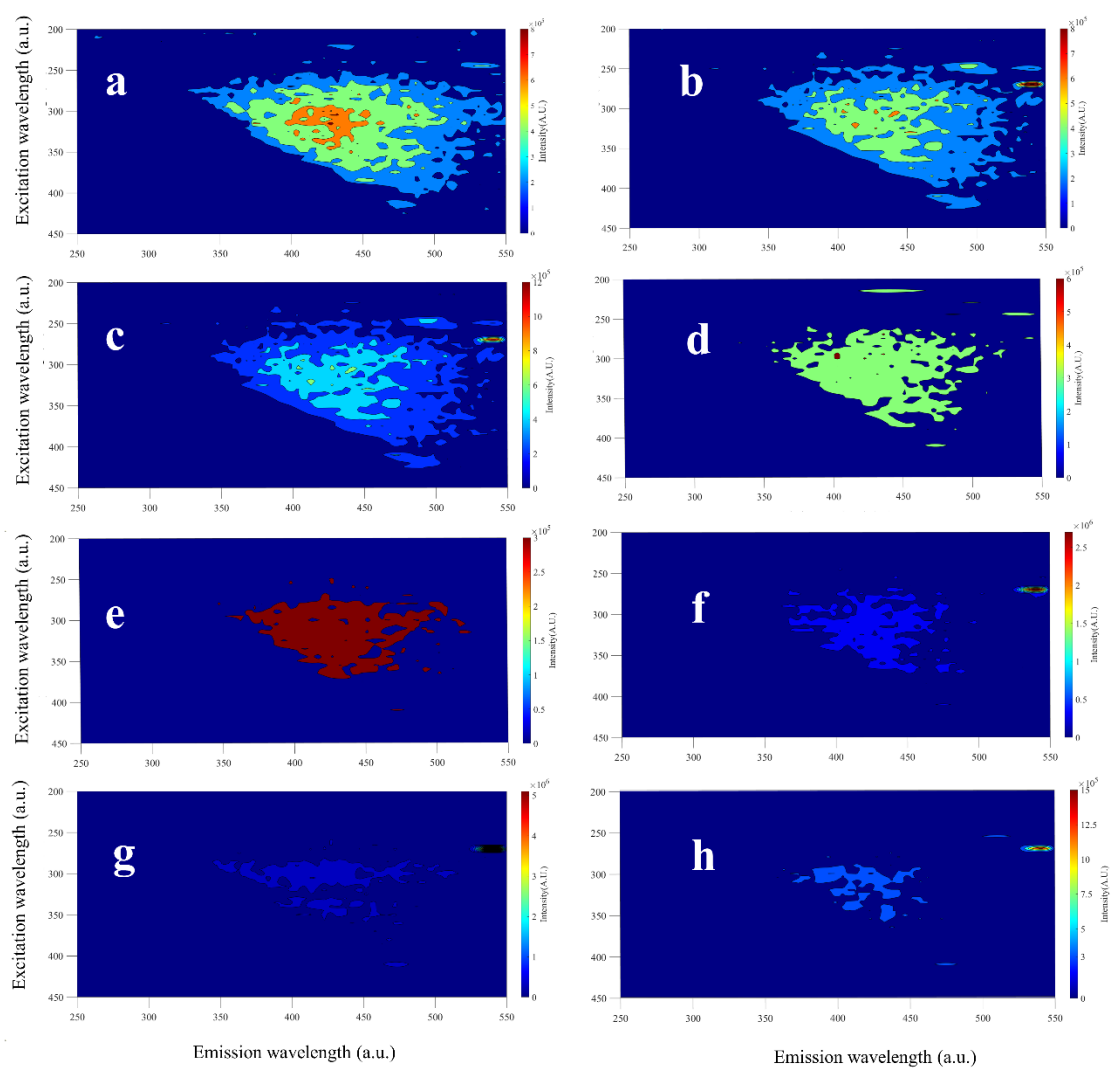


Fig. S1 Fluorescence quenching process of dissolved organic matter (DOM) in dryland soil under different  $\text{Cu}^{2+}$  concentrations.  $\text{Cu}^{2+}$  concentration a. 0, b. 5, c. 10, d. 20, e. 30, f. 50, g. 75, h. 100  $\mu\text{mol}\cdot\text{L}^{-1}$ .

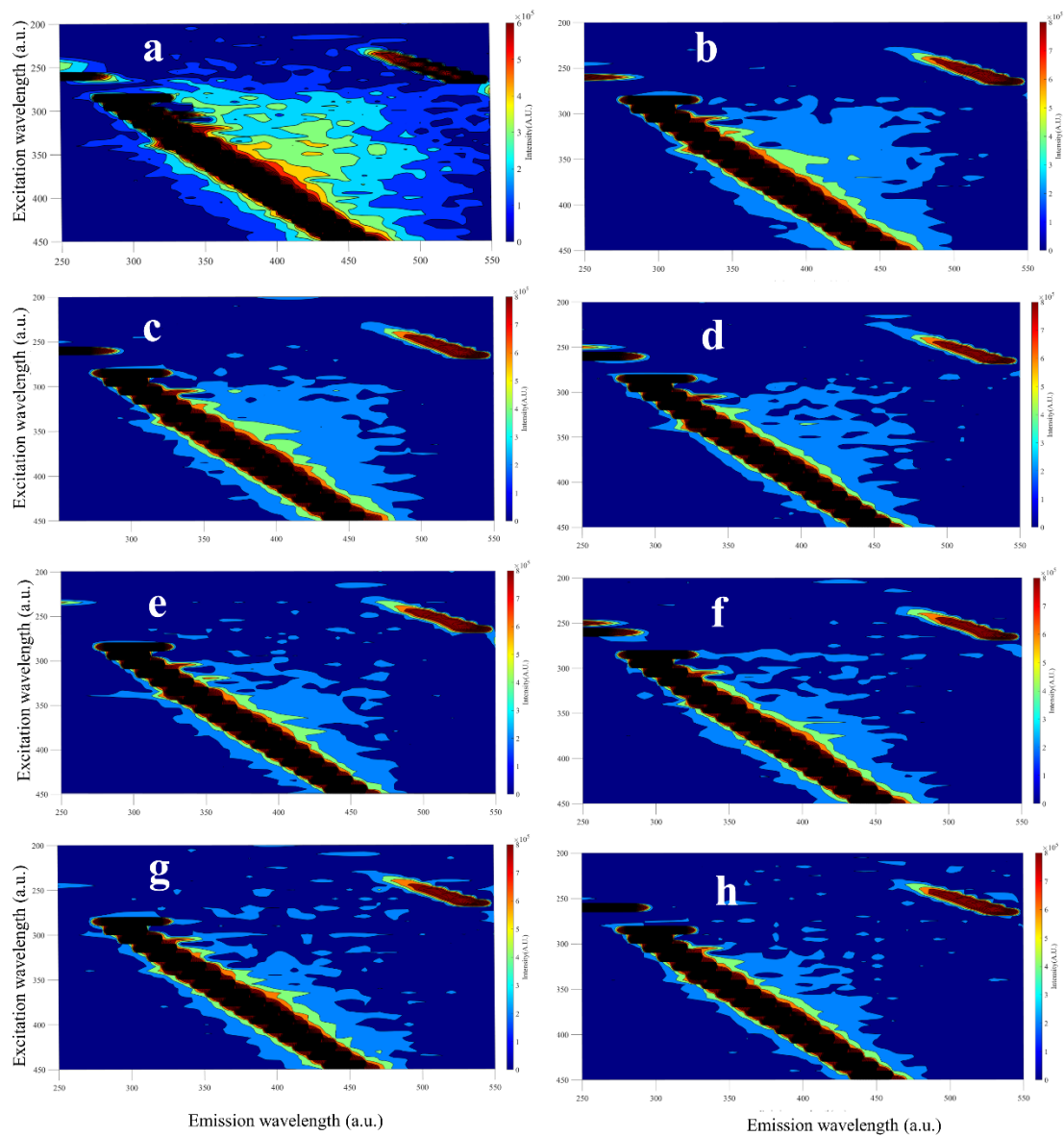


Fig. S2 Fluorescence quenching process of dissolved organic matter (DOM) in forest soil under different  $\text{Cu}^{2+}$  concentrations.  $\text{Cu}^{2+}$  concentration a. 0, b. 5, c. 10, d. 20, e. 30, f. 50, g. 75, h. 100  $\mu\text{mol}\cdot\text{L}^{-1}$ .

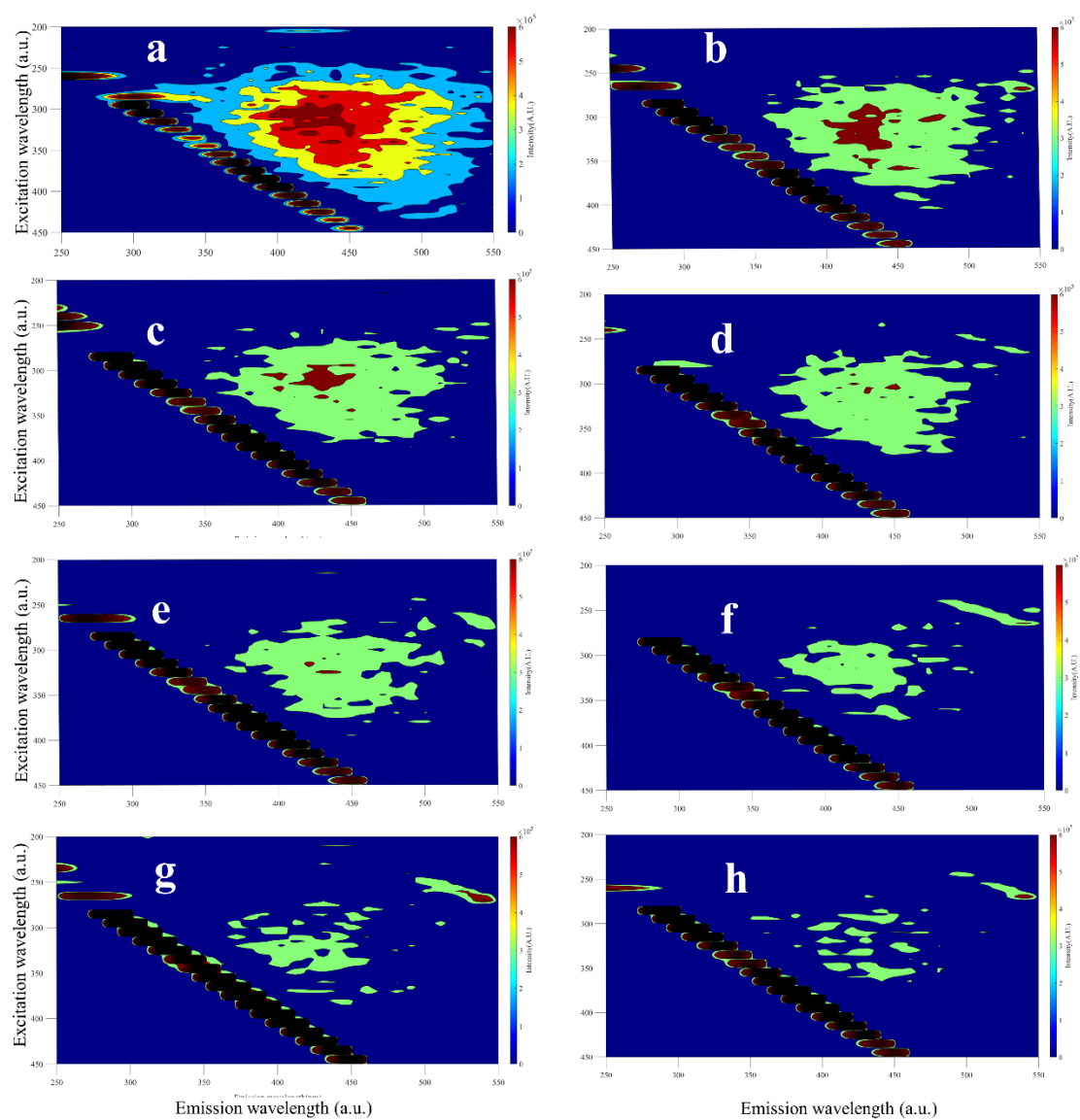


Fig. S3 Fluorescence quenching process of soil dissolved organic matter (DOM) in vegetable fields under different  $\text{Cu}^{2+}$  concentrations.  $\text{Cu}^{2+}$  concentration a. 0, b. 5, c. 10, d. 20, e. 30, f. 50, g. 75, h. 100  $\mu\text{mol}\cdot\text{L}^{-1}$ .

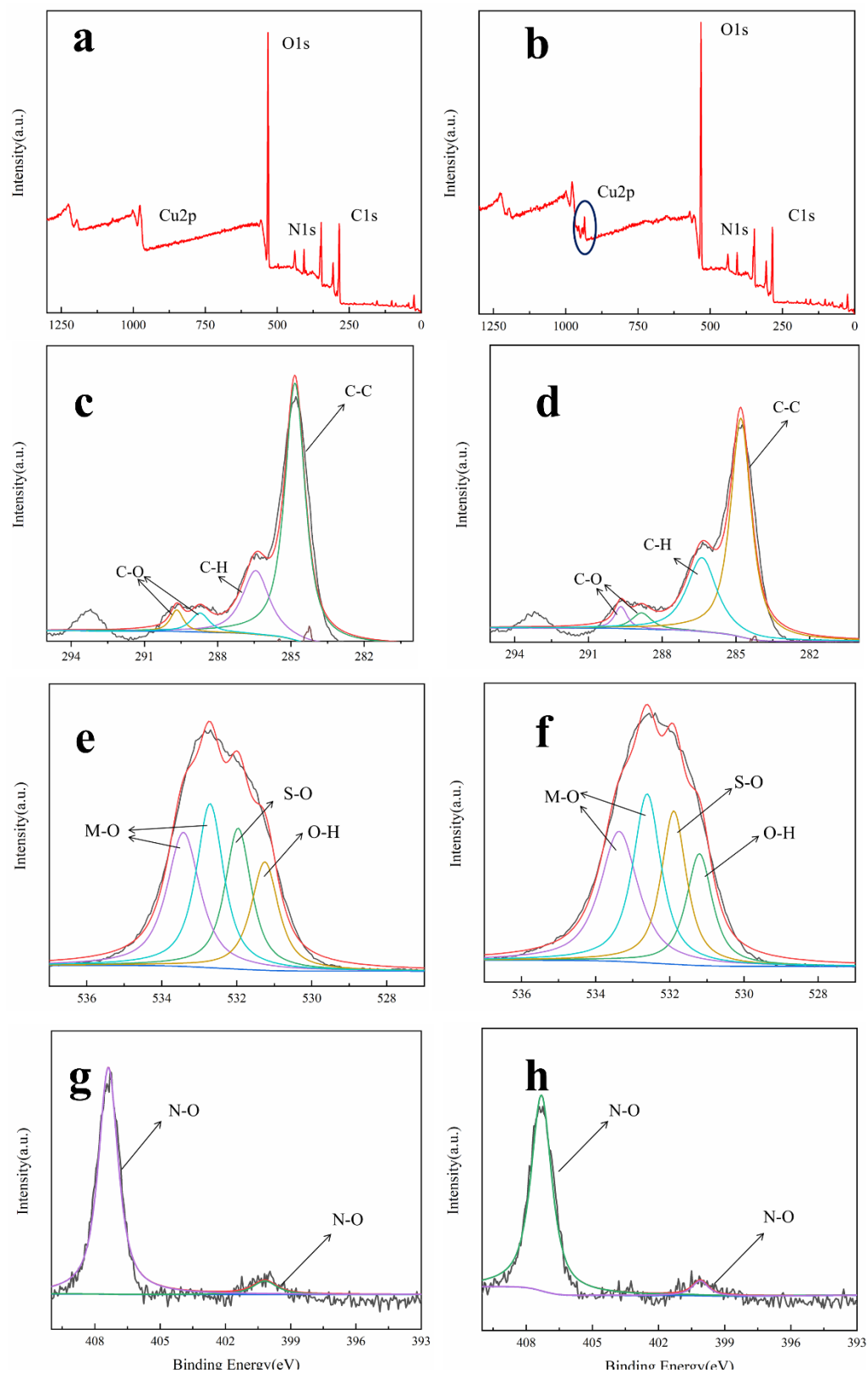


Fig. S4 XPS spectra of dissolved organic matter (DOM) of dry farmland soil before and after combination with  $\text{Cu}^{2+}$ . a and b. Full XPS spectra of without and with DOM combination with  $\text{Cu}^{2+}$ ; c, d, e, f, g, and h were C, O, and N spectra of DOM without and with DOM combination with  $\text{Cu}^{2+}$ , respectively.

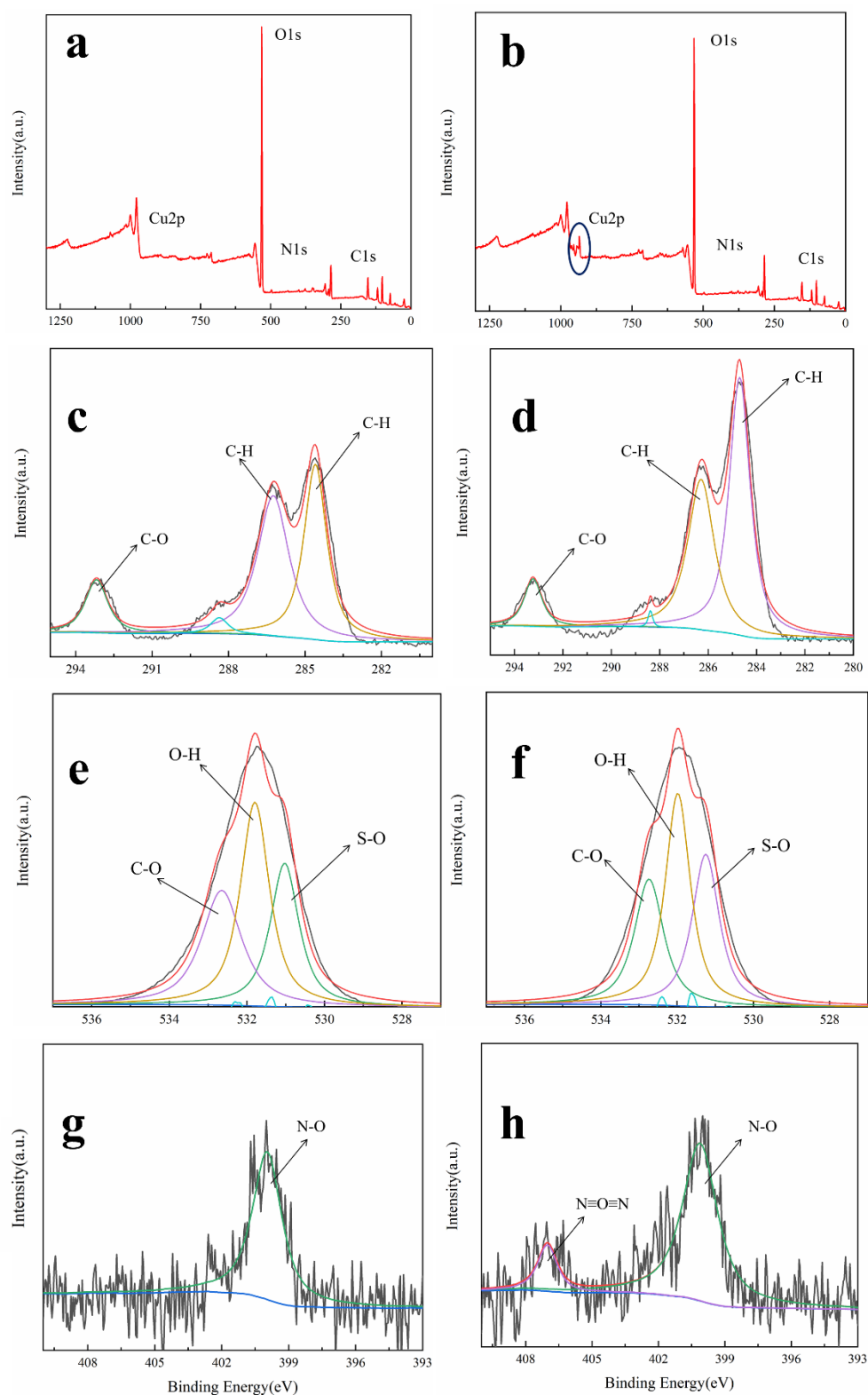


Fig. S5 XPS spectra of dissolved organic matter (DOM) of forest land soil before and after combination with  $\text{Cu}^{2+}$ . a and b. Full XPS spectra of without and with DOM combination with  $\text{Cu}^{2+}$ ; c, d, e, f, g, and h were C, O, and N spectra of DOM without and with DOM combination with  $\text{Cu}^{2+}$ , respectively.



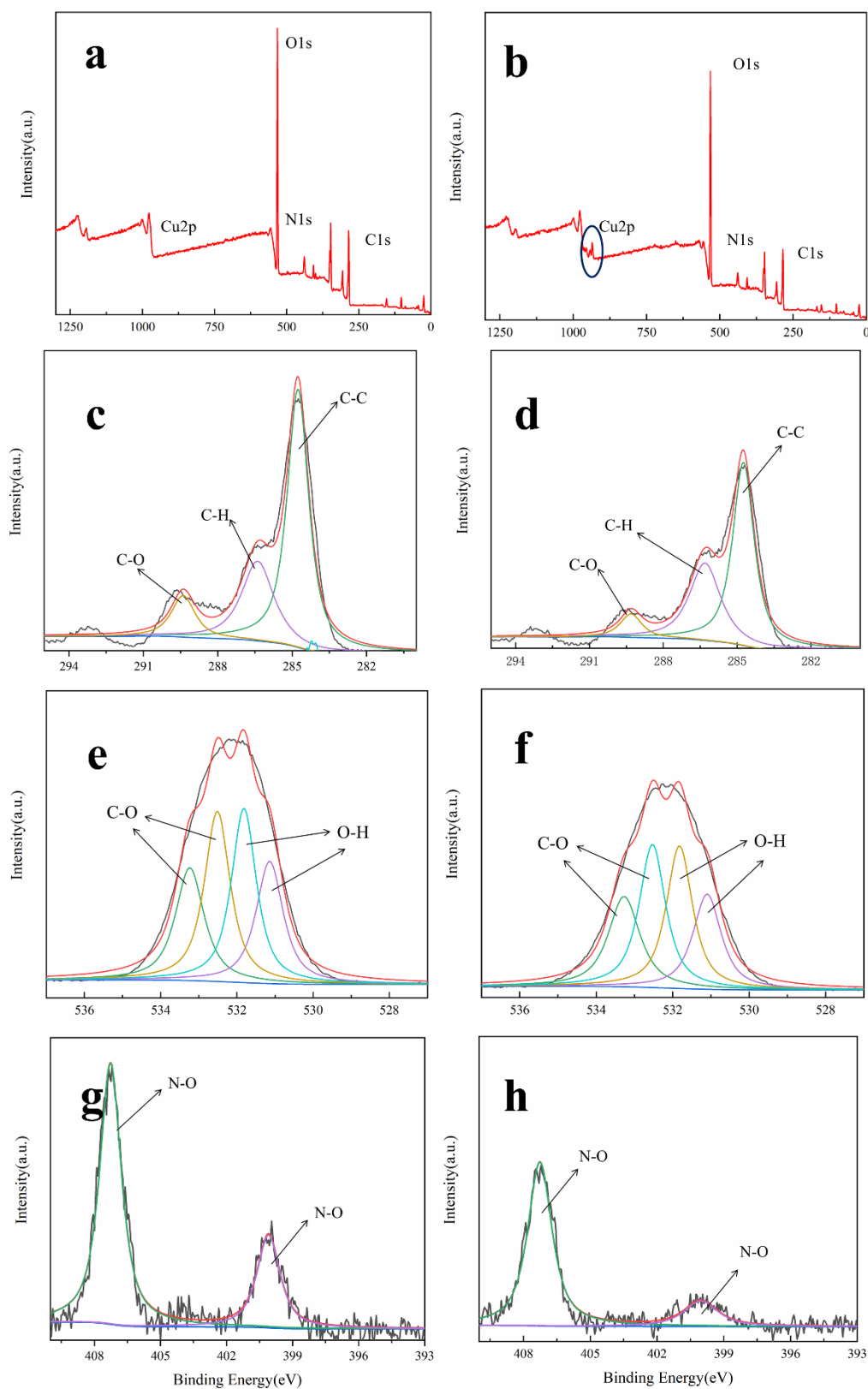


Fig. S6 XPS spectra of dissolved organic matter (DOM) of vegetable fields soil before and after combination with  $\text{Cu}^{2+}$ . a and b. Full XPS spectra of without and with DOM combination with  $\text{Cu}^{2+}$ ; c, d, e, f, g, and h were C, O, and N spectra of DOM without and with DOM combination with  $\text{Cu}^{2+}$ , respectively.