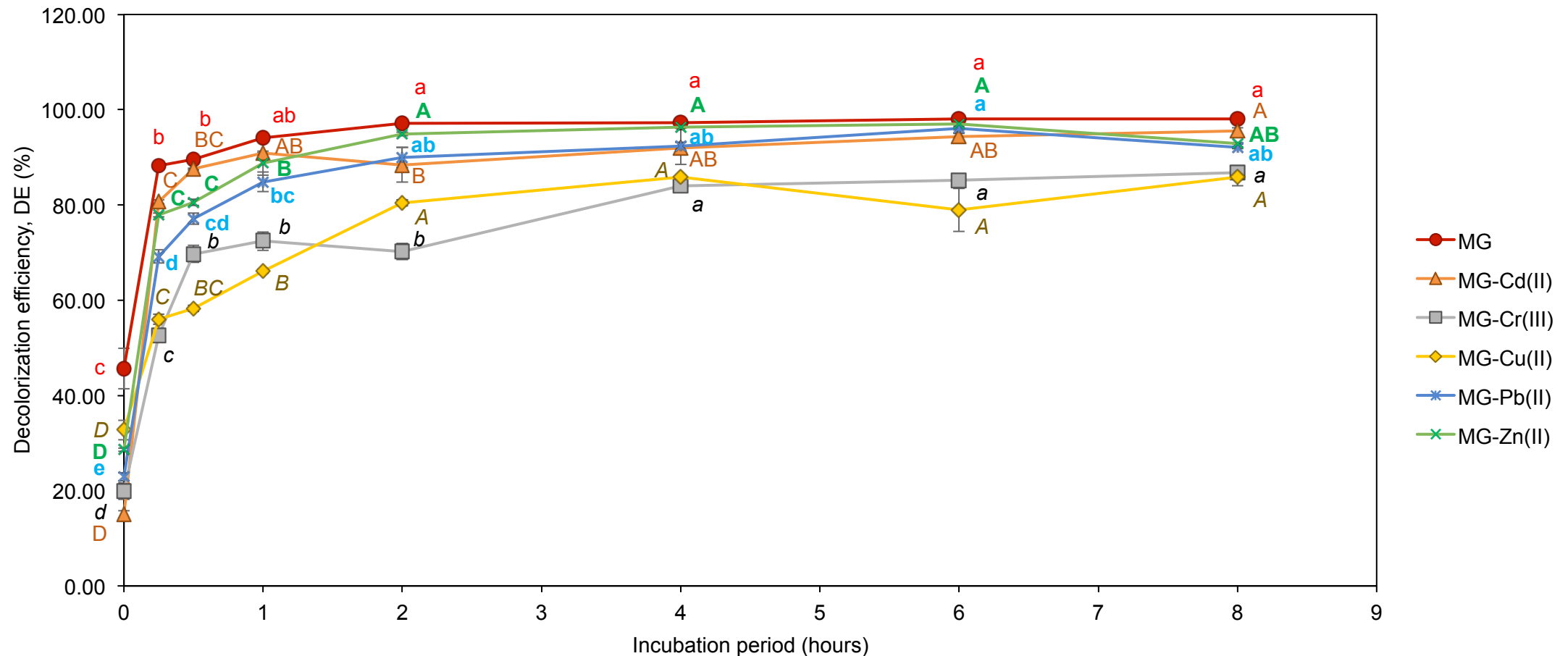
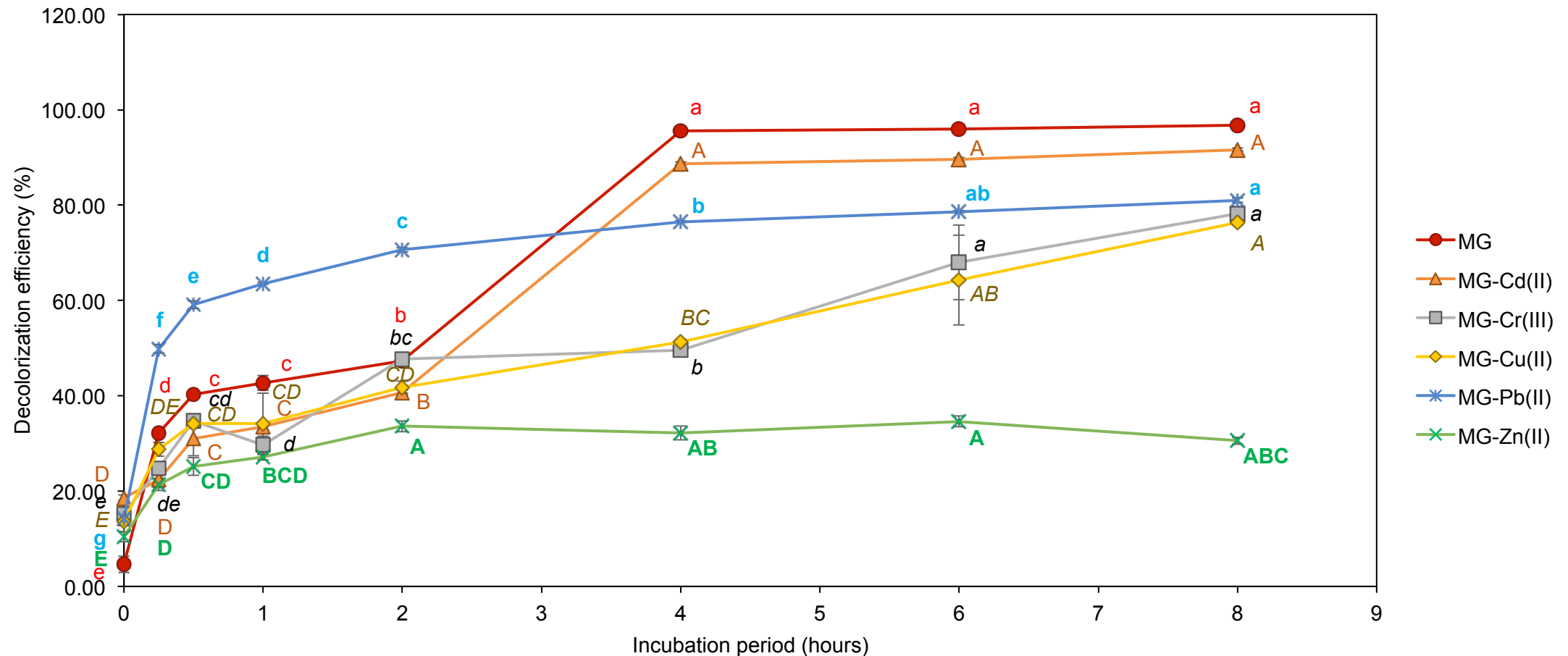


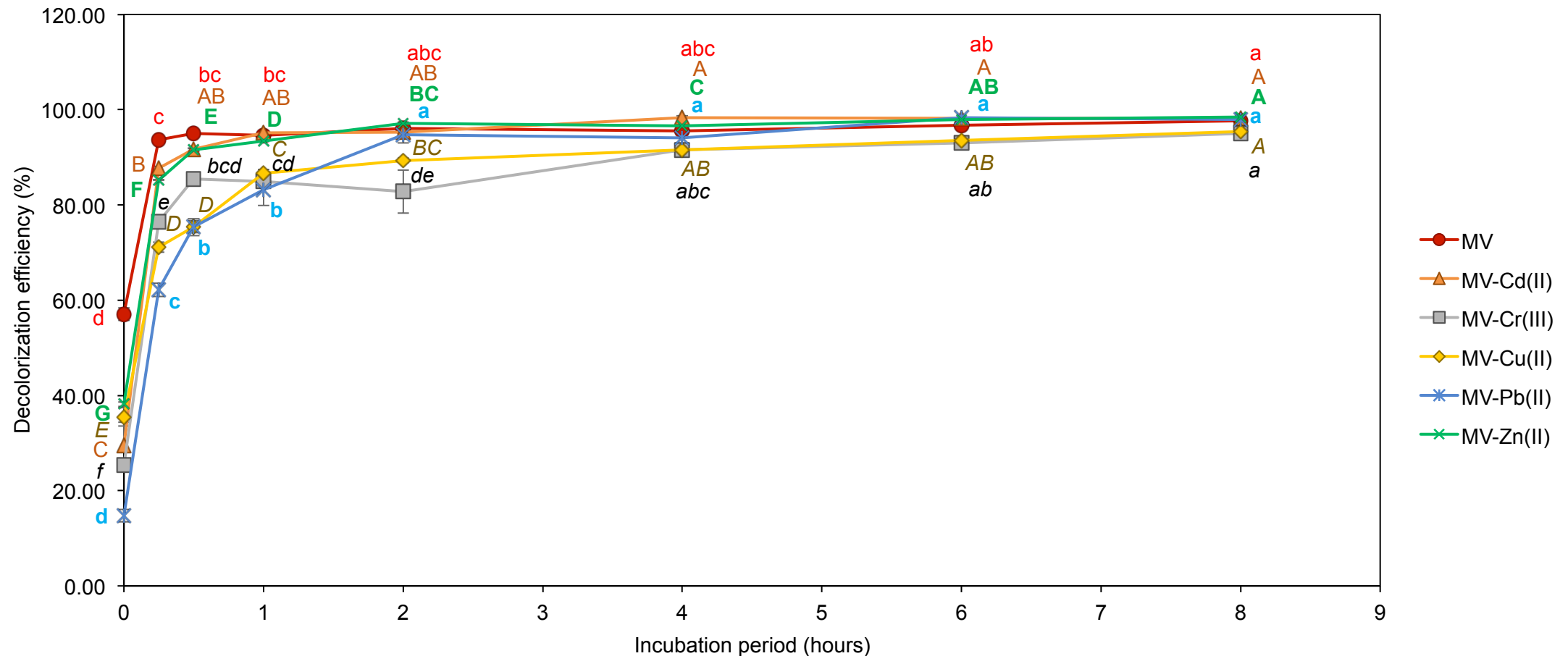
Supplementary Fig. S1 Decolorization efficiency of live *P. simplicissimum* for single MG and MG-metal mixtures over 8 h at 25±2°C. Means with the same letters within each treatment are not significantly different (HSD_(0.05)). Bars indicate standard error of means (±SEM).



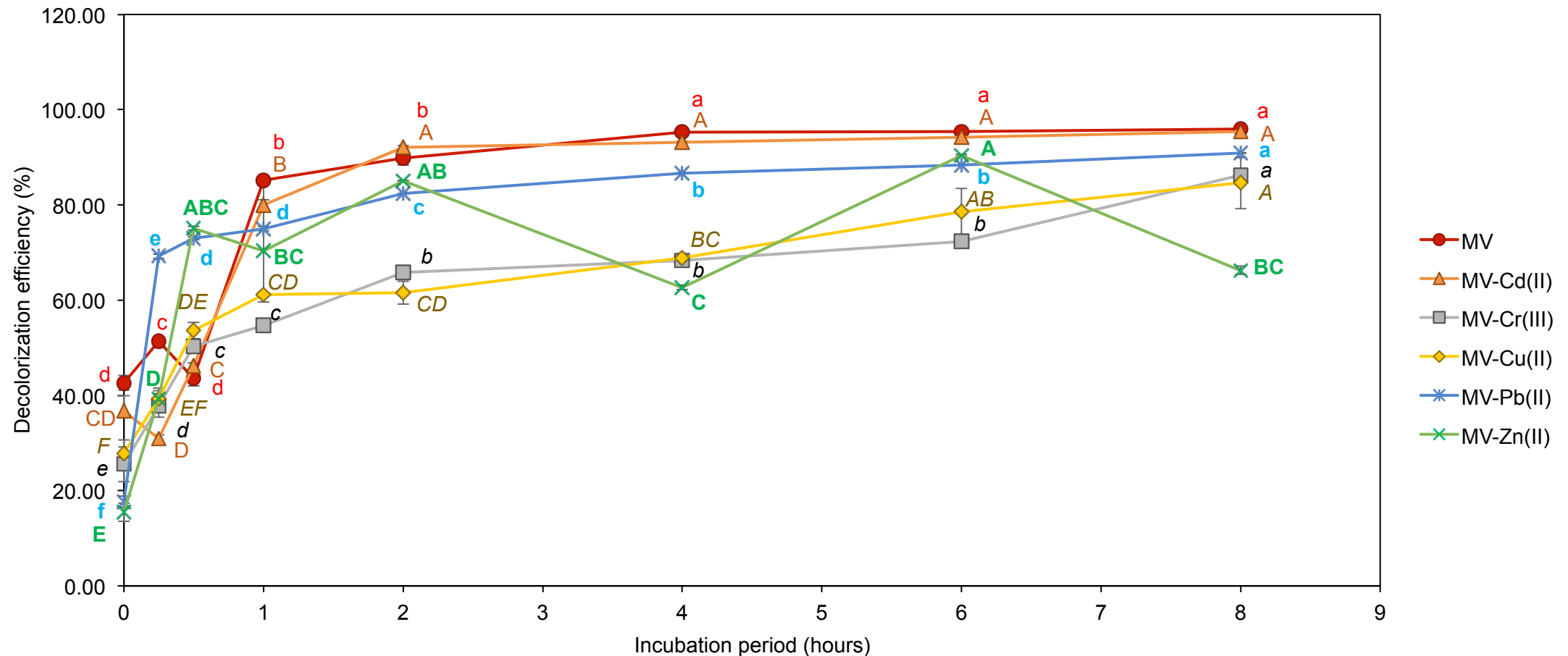
Supplementary Fig. S2 Decolorization efficiency of dead *P. simplicissimum* for single MG and MG-metal mixtures over 8 h at $25\pm 2^{\circ}\text{C}$. Means with the same letters within each treatment are not significantly different ($\text{HSD}_{(0.05)}$). Bars indicate standard error of means ($\pm\text{SEM}$).



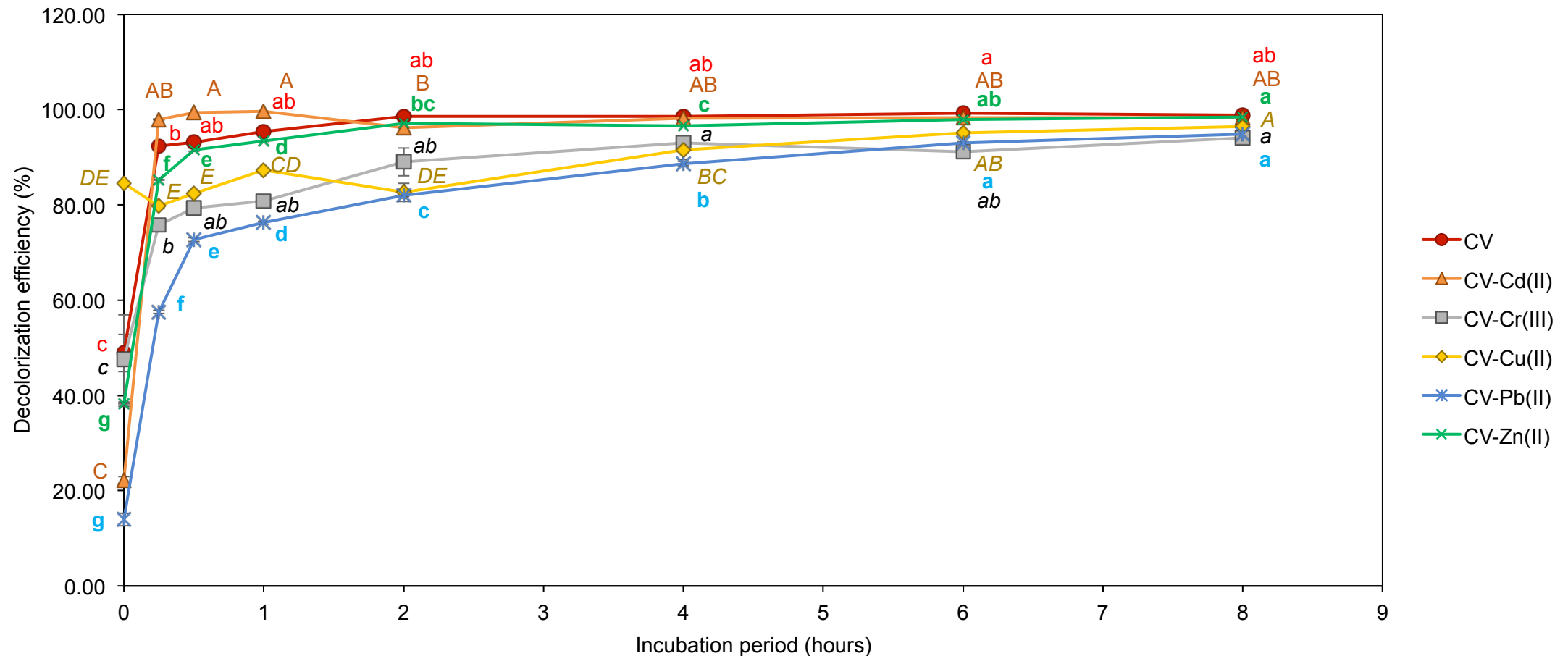
Supplementary Fig. S3 Decolorization efficiency of live *P. simplicissimum* for single MV and MV-metal mixtures over 8 h at 25±2°C. Means with the same letters within each treatment are not significantly different (HSD_(0.05)). Bars indicate standard error of means (±SEM).



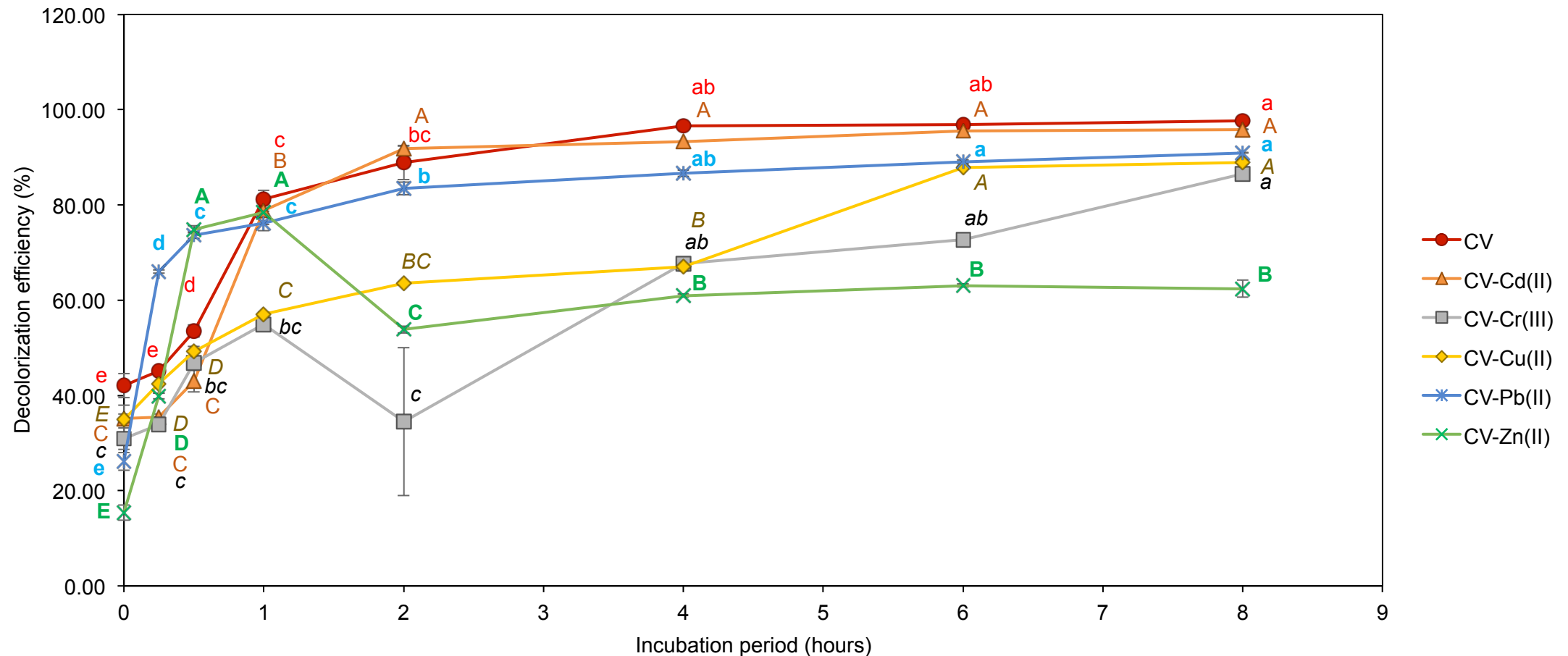
Supplementary Fig. S4 Decolorization efficiency of dead *P. simplicissimum* for single MV and MV-metal mixtures over 8 h at $25\pm 2^\circ\text{C}$. Means with the same letters within each treatment are not significantly different ($\text{HSD}_{(0.05)}$). Bars indicate standard error of means ($\pm\text{SEM}$).



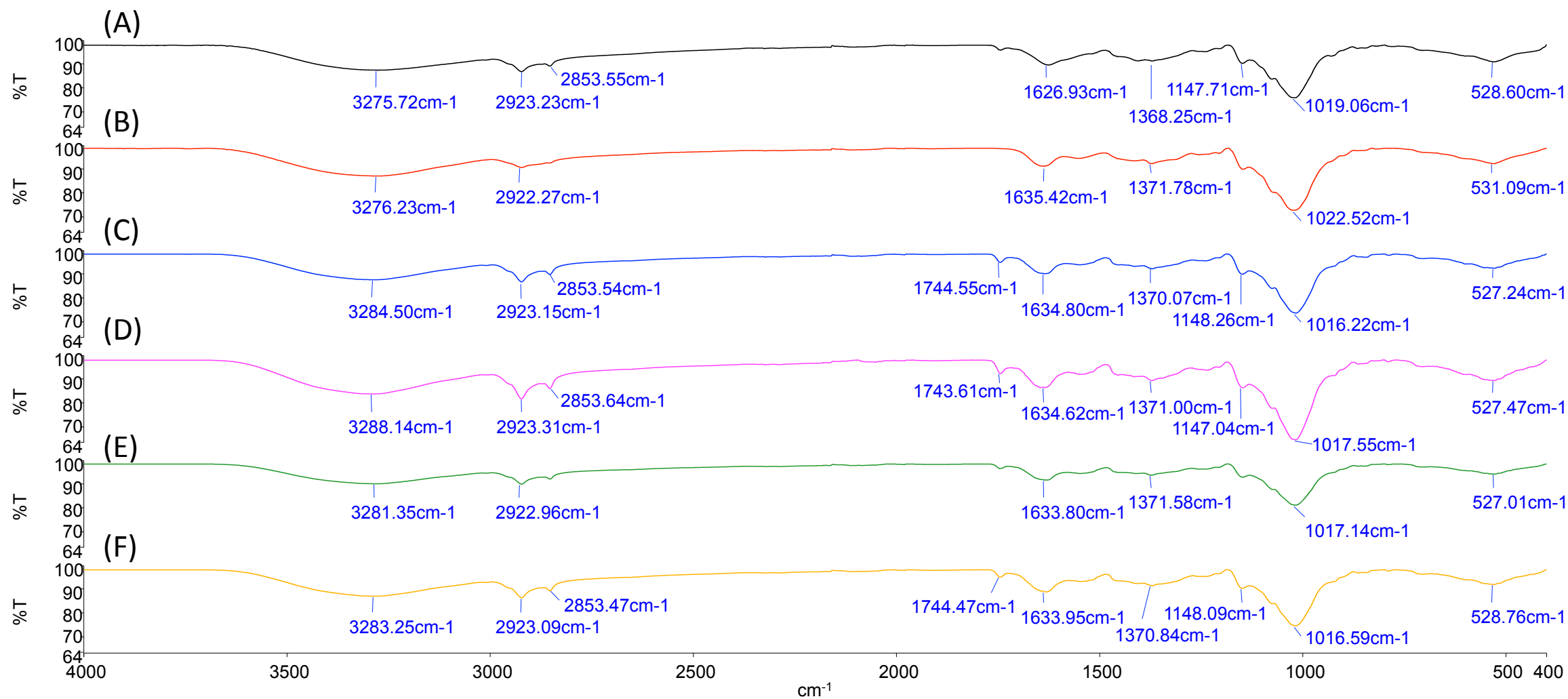
Supplementary Fig. S5 Decolorization efficiency of live *P. simplicissimum* for single CV and CV-metal mixtures over 8 h at 25±2°C. Means with the same letters within each treatment are not significantly different (HSD_(0.05)). Bars indicate standard error of means (±SEM).



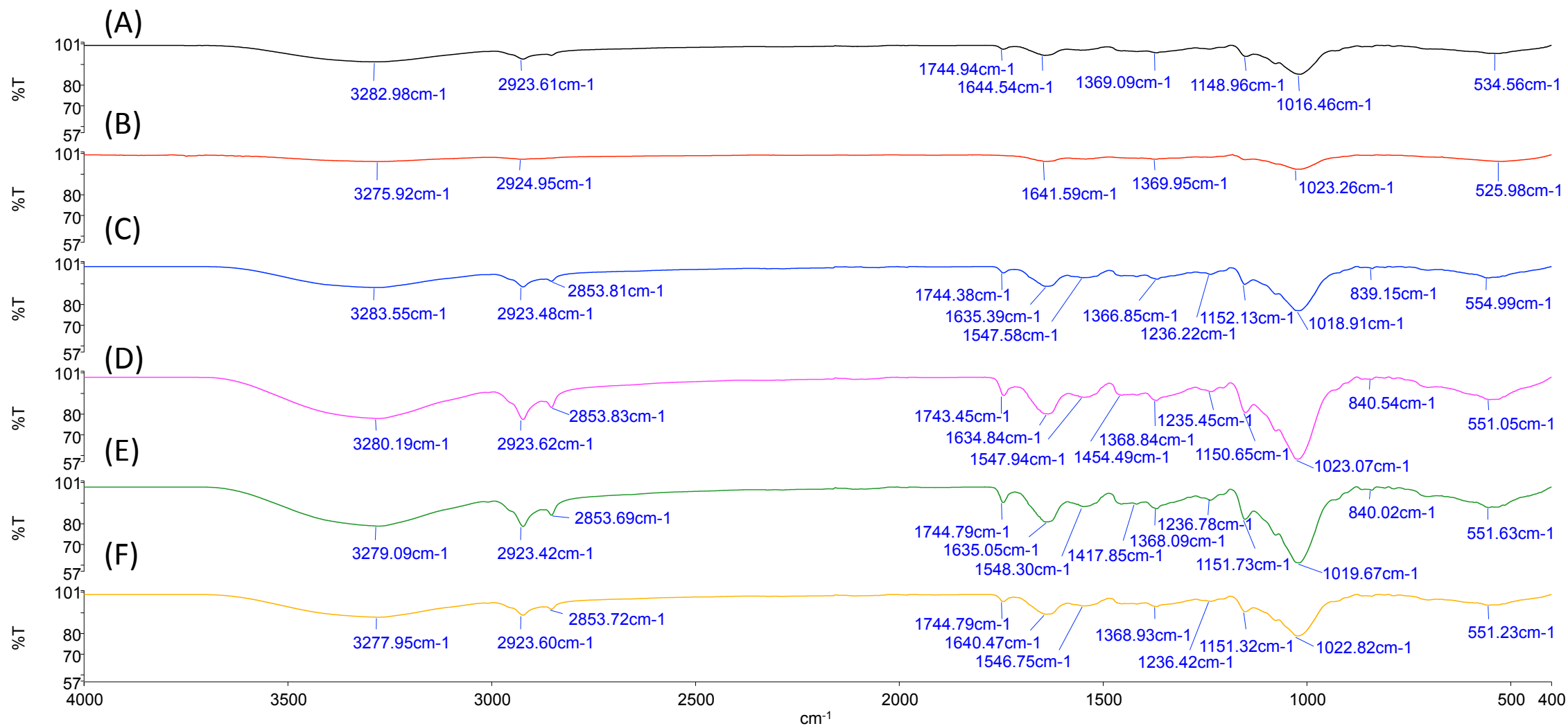
Supplementary Fig. S6 Decolorization efficiency of dead *P. simplicissimum* for single CV and CV-metal mixtures over 8 h at 25±2°C. Means with the same letters within each treatment are not significantly different (HSD_(0.05)). Bars indicate standard error of means (±SEM).



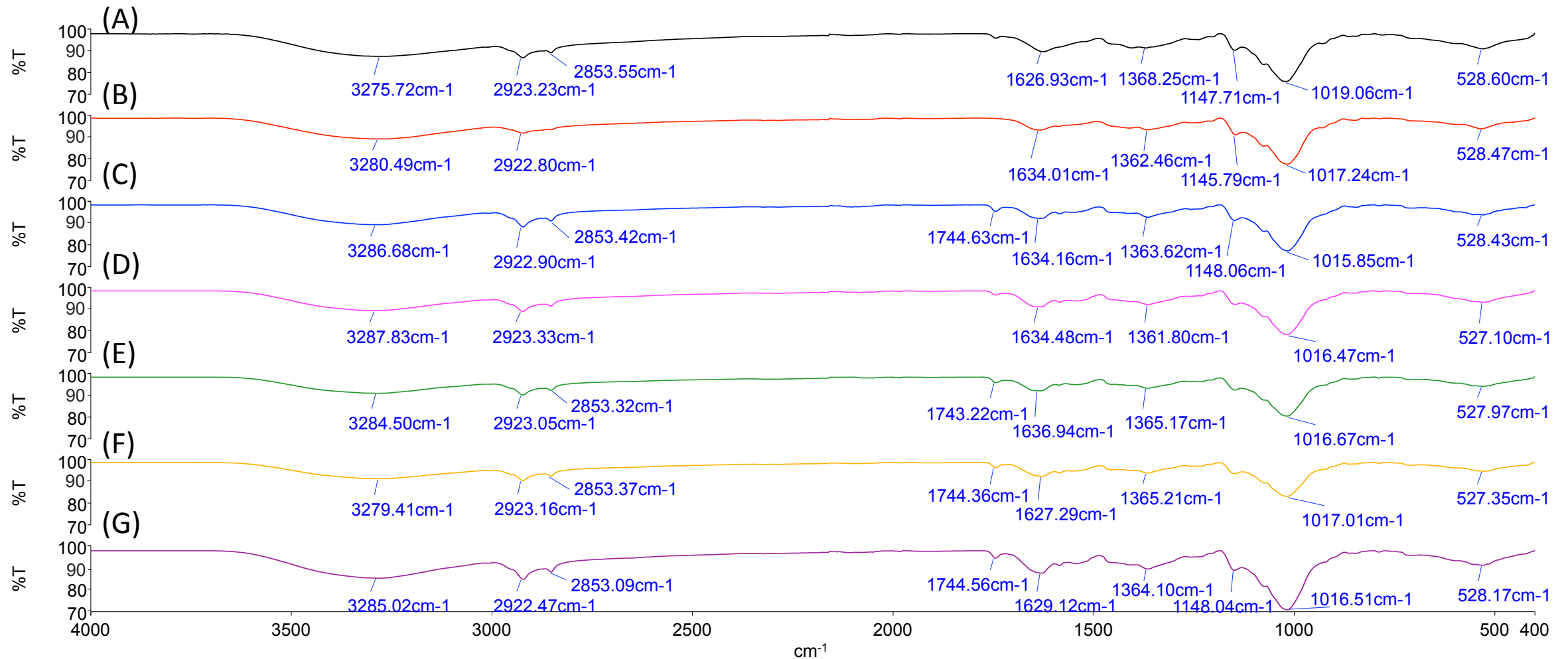
Supplementary Fig. S7 FTIR spectra of live biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) CB, (C) CB-Cd(II), (D) CB-Cu(II), (E) CB-Pb(II) and (F) CB-Zn(II).



Supplementary Fig. S8 FTIR spectra of dead biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) CB, (C) CB-Cd(II), (D) CB-Cu(II), (E) CB-Pb(II) and (F) CB-Zn(II).



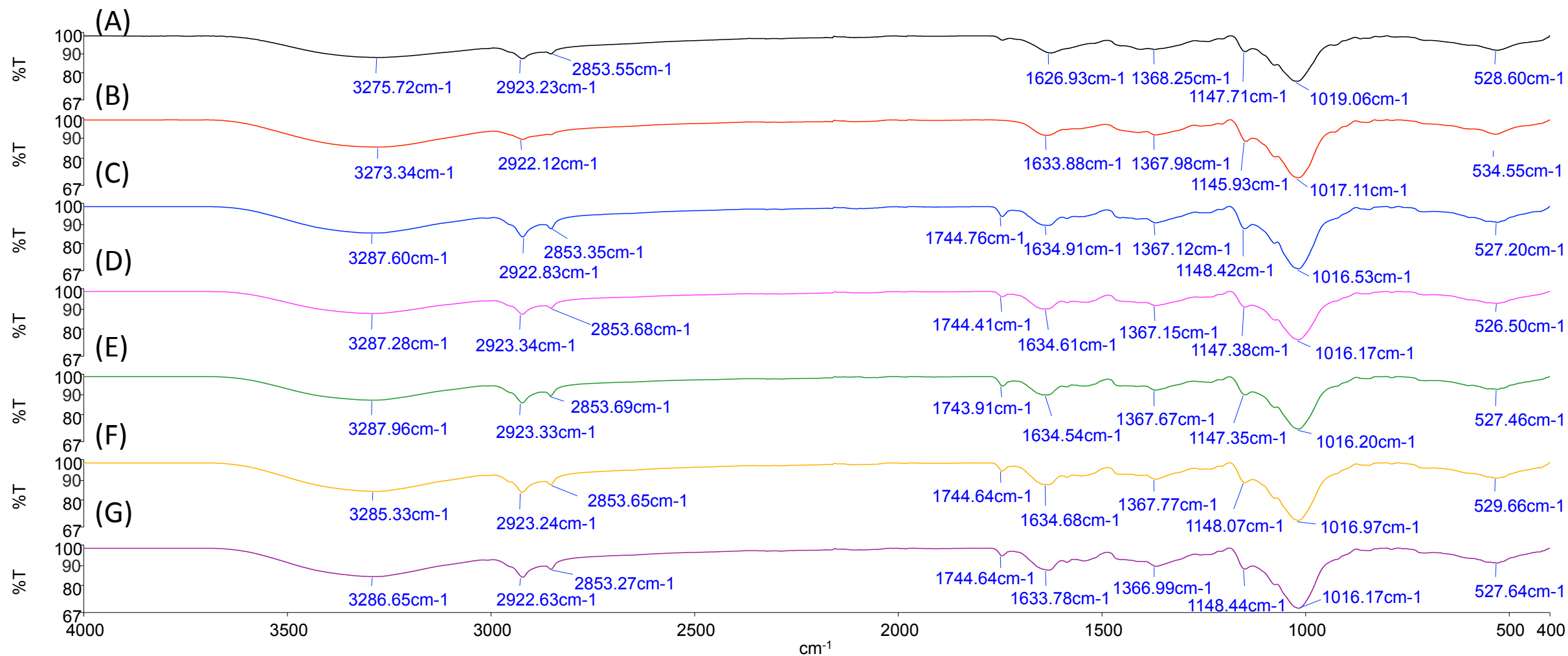
Supplementary Fig. S9 FTIR spectra of live biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) CV, (C) CV-Cd(II), (D) CV-Cr(III), (E) CV-Cu(II), (F) CV-Pb(II) and (G) CV-Zn(II).



Supplementary Table S10. FTIR band positions (cm⁻¹) of live biomass of *P. simplicissimum* before treatment and after treatment with single CV and CV-metal mixtures.

Unloaded	CV	CV-Cd(II)	CV-Cr(III)	CV-Cu(II)	CV-Pb(II)	CV-Zn(II)	Suggested assignment
3276	3280	3287	3288	3285	3279	3285	O-H and N-H stretching vibrations
2923	2923	2923	2923	2923	2923	2922	C-H asymmetric stretching
2854	-	2853	-	2853	2853	2853	C-H symmetric stretching
-	-	1745	-	1743	1744	1745	C=O stretching of ester
1627	1634	1634	1634	1637	1627	1629	C=O stretching vibration and NH deformation (amide I region)
1368	1362	1364	1362	1365	1365	1364	Amide III
1148	1146	1148	-	-	-	1148	Phosphate group
1019	1017	1016	1016	1017	1017	1017	C-C, C=C, C-O-C, C-O-P of saccharides
529	528	528	527	528	527	528	Nitro compounds and disulphide groups

Supplementary Fig. S11 FTIR spectra of live biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) MV, (C) MV-Cd(II), (D) MV-Cr(III), (E) MV-Cu(II), (F) MV-Pb(II) and (G) MV-Zn(II).



Supplementary Table S12. FTIR band positions (cm⁻¹) of live biomass of *P. simplicissimum* before treatment and after treatment with single MV and MV-metal mixtures.

Unloaded	MV	MV-Cd(II)	MV-Cr(III)	MV-Cu(II)	MV-Pb(II)	MV-Zn(II)	Suggested assignment
3276	3273	3288	3287	3288	3285	3287	O-H and N-H stretching vibrations
2923	2922	2923	2923	2923	2923	2923	C-H asymmetric stretching
2854	-	2853	2854	2854	2854	2853	C-H symmetric stretching
-	-	1745	1744	1744	1745	1745	C=O stretching of ester
1627	1634	1635	1635	1635	1635	1634	C=O stretching vibration and NH deformation (amide I region)
1368	1368	1367	1367	1368	1368	1367	Amide III
1148	1146	1148	1147	1147	1148	1148	Phosphate group
1019	1017	1017	1016	1016	1017	1016	C-C, C=C, C-O-C, C-O-P of saccharides
529	535	527	527	527	530	528	Nitro compounds and disulphide groups

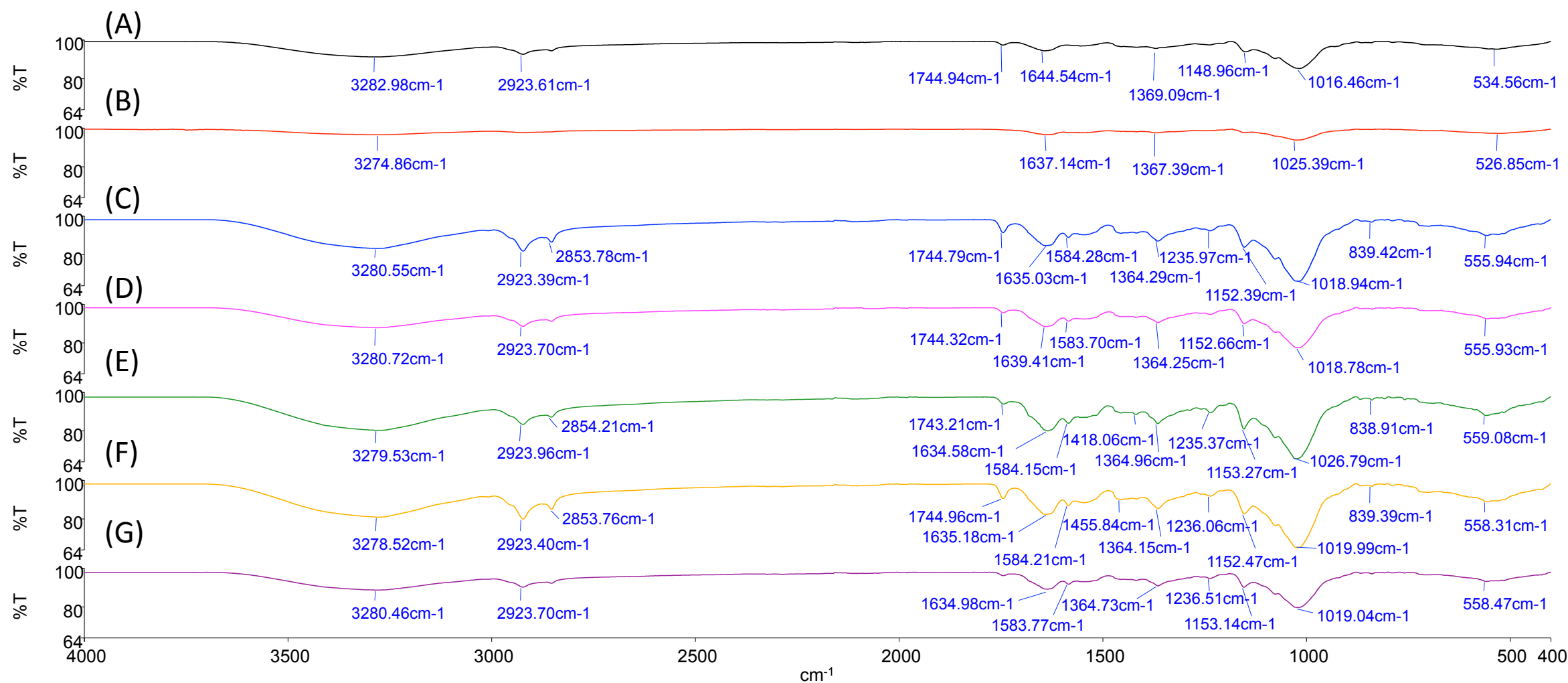
Supplementary Fig. S13 FTIR spectra of live biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) MG, (C) MG-Cd(II), (D) MG-Cr(III), (E) MG-Cu(II), (F) MG-Pb(II) and (G) MG-Zn(II).



Supplementary Table S14. FTIR band positions (cm⁻¹) of live biomass of *P. simplicissimum* before treatment and after treatment with single MG and MG-metal mixtures.

Unloaded	MG	MG-Cd(II)	MG-Cr(III)	MG-Cu(II)	MG-Pb(II)	MG-Zn(II)	Suggested assignment
3276	3271	3279	3288	3300	3287	3286	O-H and N-H stretching vibrations
2923	2923	2923	2923	2923	2923	2923	C-H asymmetric stretching
2854	-	2853	2854	2854	2853	2853	C-H symmetric stretching
-	-	1744	1745	1744	1745	1745	C=O stretching of ester
1627	1635	1635	1635	1635	1628	1634	C=O stretching vibration and NH deformation (amide I region)
1368	1370	1370	1370	1369	1371	1370	Amide III
-	-	1239	-	-	-	-	Phosphate group
1148	1146	1148	1147	1148	1148	1148	Phosphate group
-	-	1076	-	-	-	-	Phosphate group
1019	1015	1019	1016	1016	1016	1016	C-C, C=C, C-O-C, C-O-P of saccharides
-	-	847	-	-	-	-	Aromatic C-H stretching
529	535	531	530	527	527	528	Nitro compounds and disulphide groups

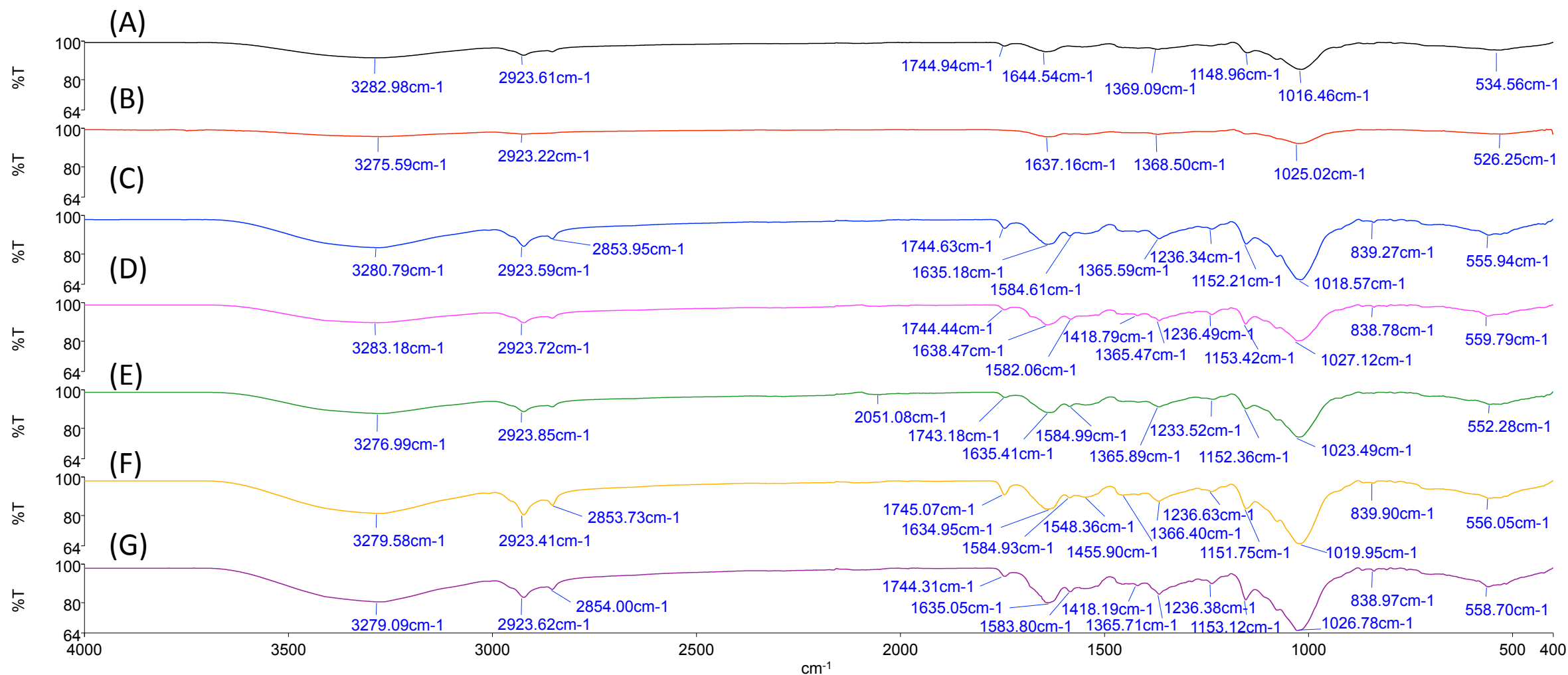
Supplementary Fig. S15 FTIR spectra of dead biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) CV, (C) CV-Cd(II), (D) CV-Cr(III), (E) CV-Cu(II), (F) CV-Pb(II) and (G) CV-Zn(II).



Supplementary Table S16. FTIR band positions (cm⁻¹) of dead biomass of *P. simplicissimum* before treatment and after treatment with single CV and CV-metal mixtures.

Unloaded	CV	CV-Cd(II)	CV-Cr(III)	CV-Cu(II)	CV-Pb(II)	CV-Zn(II)	Suggested assignment
3283	3275	3281	3281	3280	3279	3280	O-H and N-H stretching vibrations
2924	-	2923	2924	2924	2923	2924	C-H asymmetric stretching
-	-	2854	-	2854	2854	-	C-H symmetric stretching
1745	-	1745	1744	1743	1745	-	C=O stretching of ester
1645	1637	1635	1639	1635	1635	1635	C=O stretching vibration and NH deformation (amide I)
-	-	1584	1584	1584	1584	1584	N-H bending in amide II and C-N stretching in -CO-NH-
-	-	-	-	1418	1456	-	C-N stretching and N-H bending of amide III
1369	1367	1364	1364	1365	1364	1365	Amide III
-	-	1236	-	1235	1236	1237	Phosphate group
1149	-	1152	1153	1153	1152	1153	Phosphate group
1016	1025	1019	1019	1027	1020	1019	C-C, C=C, C-O-C, C-O-P of saccharides
-	-	839	-	839	839	-	Aromatic C-H stretching
535	527	556	556	559	558	558	Nitro compounds and disulphide groups

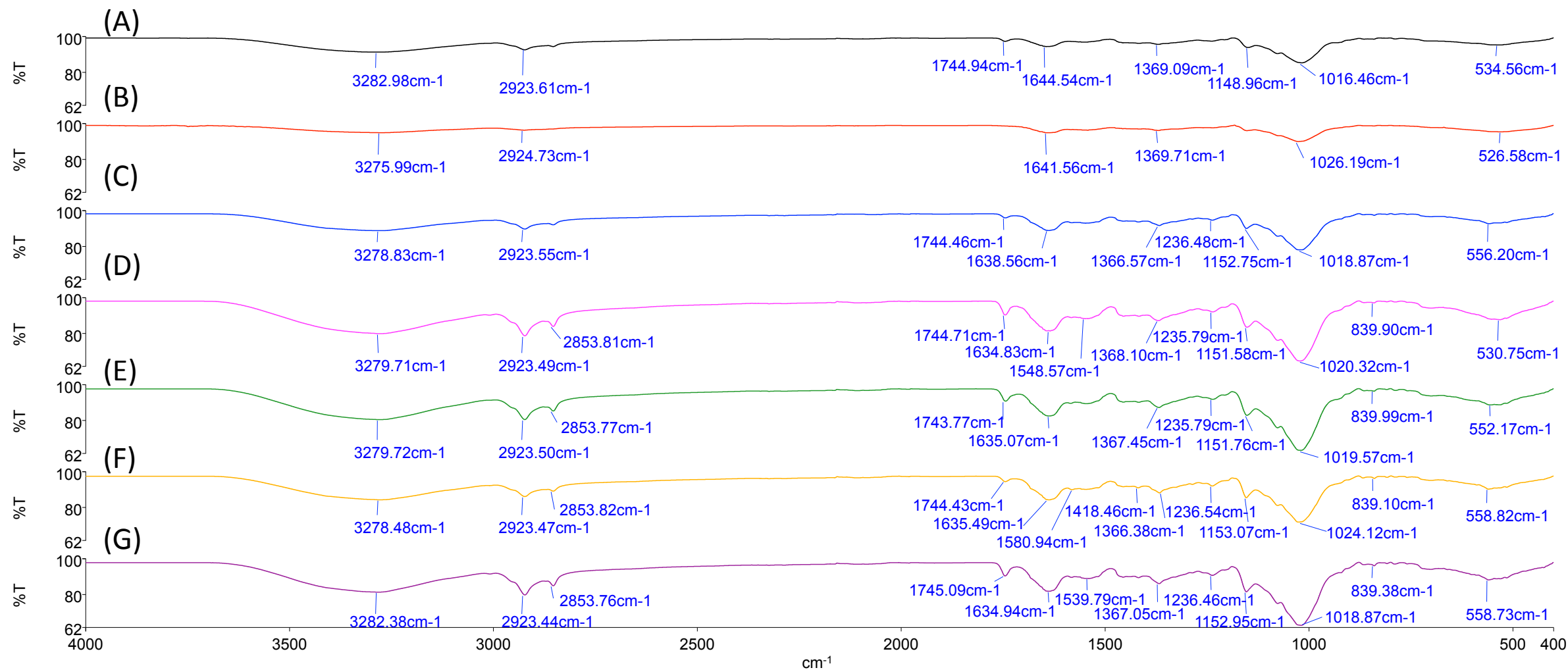
Supplementary Fig. S17 FTIR spectra of dead biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) MV, (C) MV-Cd(II), (D) MV-Cr(III), (E) MV-Cu(II), (F) MV-Pb(II) and (G) MV-Zn(II).



Supplementary Table S18. FTIR band positions (cm⁻¹) of dead biomass of *P. simplicissimum* before treatment and after treatment with single MV and MV-metal mixtures.

Unloaded	MV	MV-Cd(II)	MV-Cr(III)	MV-Cu(II)	MV-Pb(II)	MV-Zn(II)	Suggested assignment
3283	3276	3281	3283	3277	3280	3279	O-H and N-H stretching vibrations
2924	2923	2924	2924	2924	2923	2924	C-H asymmetric stretching
-	-	2854	-	-	2854	2854	C-H symmetric stretching
1745		1745	1744	1743	1745	1744	C=O stretching of ester
1645	1637	1635	1638	1635	1635	1635	C=O stretching vibration and NH deformation (amide I)
-	-	1585	1582	1585	1585	1584	N-H bending in amide II and C-N stretching in –CO–NH–
-	-	-	-	-	1548	-	Amide II
-	-	-	1419	-	1456	1418	C-N stretching and N-H bending of amide III
1369	1369	1366	1365	1366	1366	1366	Amide III
-	-	1236	1236	1234	1237	1236	Phosphate group
1149	-	1152	1153	1152	1152	1153	Phosphate group
1016	1025	1019	1027	1023	1020	1027	C-C, C=C, C-O-C, C-O-P of saccharides
-	-	839	839	-	840	839	Aromatic C-H stretching
535	526	556	560	552	556	559	Nitro compounds and disulphide groups

Supplementary Fig. S19 FTIR spectra of dead biomass of *P. simplicissimum* (A) before treatment and after treatment with (B) MG, (C) MG-Cd(II), (D) MG-Cr(III), (E) MG-Cu(II), (F) MG-Pb(II) and (G) MG-Zn(II).



Supplementary Table S20. FTIR band positions (cm⁻¹) of dead biomass of *P. simplicissimum* before treatment and after treatment with single MG and MG-metal mixtures.

Unloaded	MG	MG-Cd(II)	MG-Cr(III)	MG-Cu(II)	MG-Pb(II)	MG-Zn(II)	Suggested assignment
3283	3276	3279	3280	3280	3278	3282	O-H and N-H stretching vibrations
2924	2925	2924	2923	2924	2923	2923	C-H asymmetric stretching
-	-	-	2854	2854	2854	2854	C-H symmetric stretching
1745	-	1744	1745	1744	1744	1745	C=O stretching of ester
1645	1642	1639	1635	1635	1635	1635	C=O stretching vibration and NH deformation (amide I)
-	-	-	1549	-	1581	1540	N-H bending in amide II and C-N stretching in -CO-NH-
-	-	-	-	-	1418	-	C-N stretching and N-H bending of amide III
1369	1370	1367	1368	1367	1366	1367	Amide III
-	-	1236	1236	1236	1237	1236	Phosphate group
1149	-	1153	1152	1152	1153	1153	Phosphate group
1016	1026	1019	1020	1020	1024	1019	C-C, C=C, C-O-C, C-O-P of saccharides
-	-	-	840	840	839	839	Aromatic C-H stretching
535	527	556	531	552	559	559	Nitro compounds and disulphide groups