

SUPPLEMENTARY INFORMATION

Smart Nanocomposites of Chitosan/Alginate Nanoparticles Loaded with Copper Oxide as Alternative Nanofertilizers

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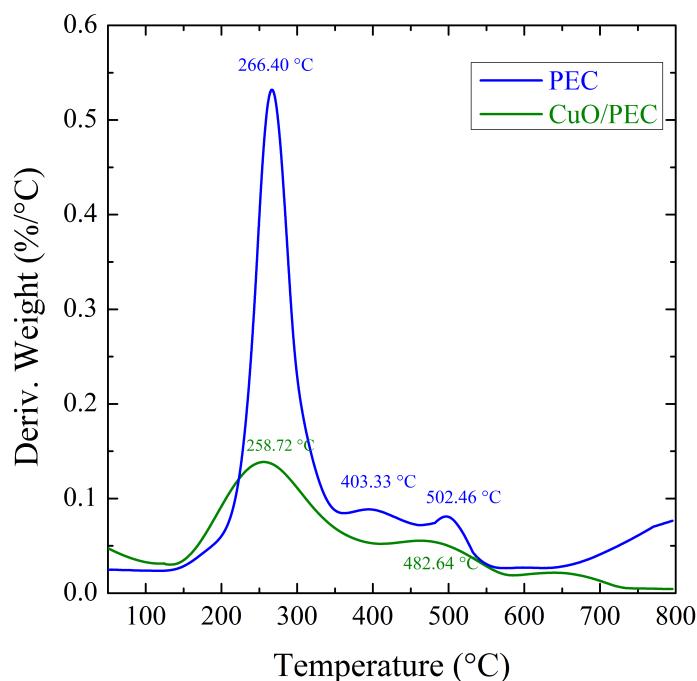


Fig. 1S. Derivative thermogravimetric Analysis (DTGA) overlay of PEC (blue trace) and CuO/PEC (green trace) samples

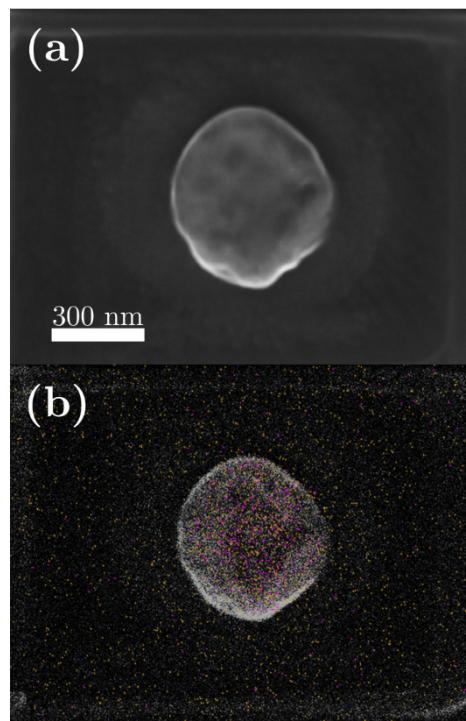


FIG. 2S **(a)** Transmission Scanning Electron Microscopy (TSEM) micrograph of a PEC nanoparticle; **(b)** Combined Energy Dispersive X-Ray (EDX) map of O-K (yellow) and P-K shells (purple) superimposed on TSEM image.

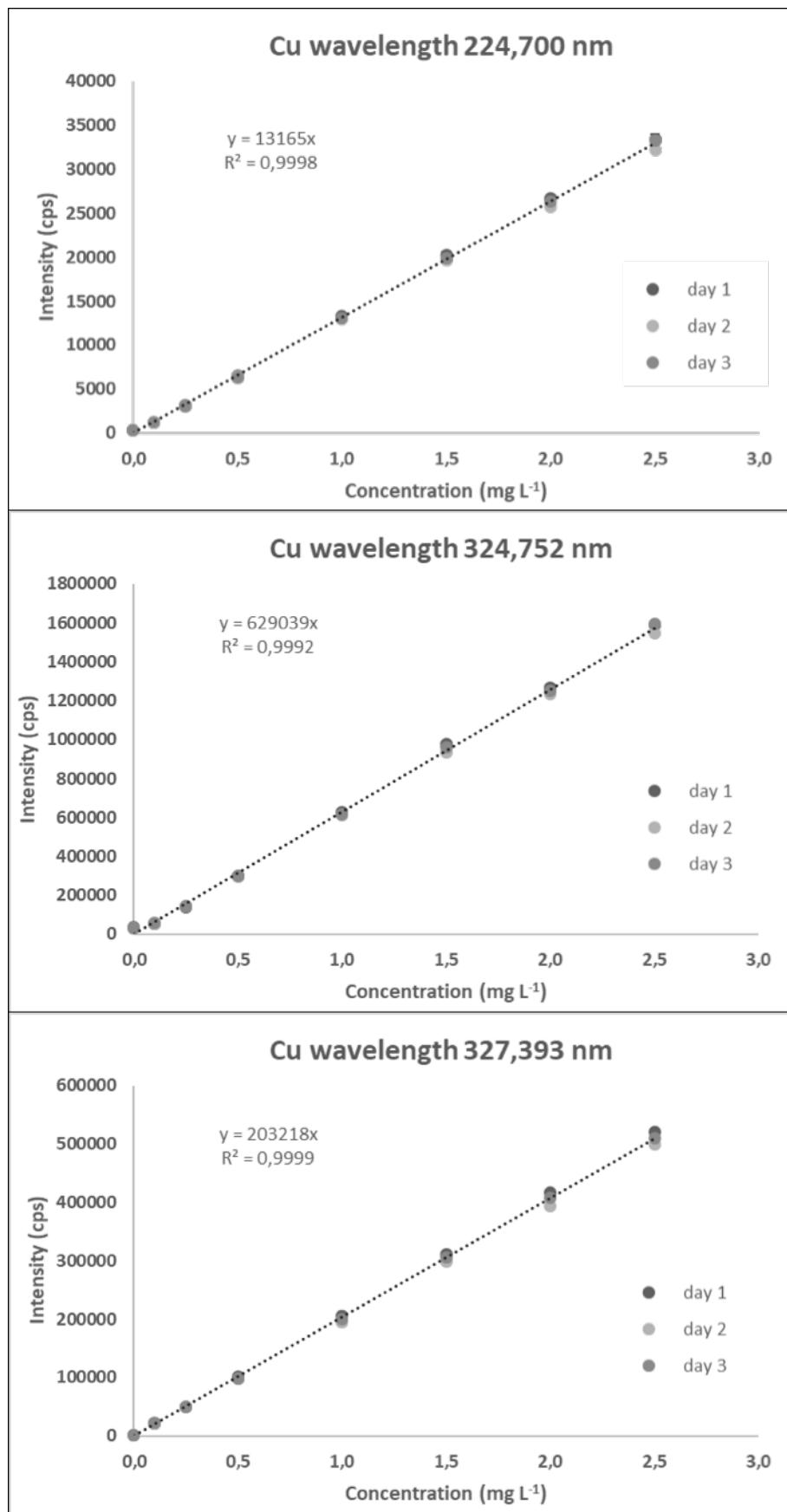


FIG. 3S Calibration curves of release experiments obtained for Cu at three different emission lines (224.700 nm, 324.752 nm, 327.393 nm) for each day of analysis. The linear fit at each wavelength was reported.

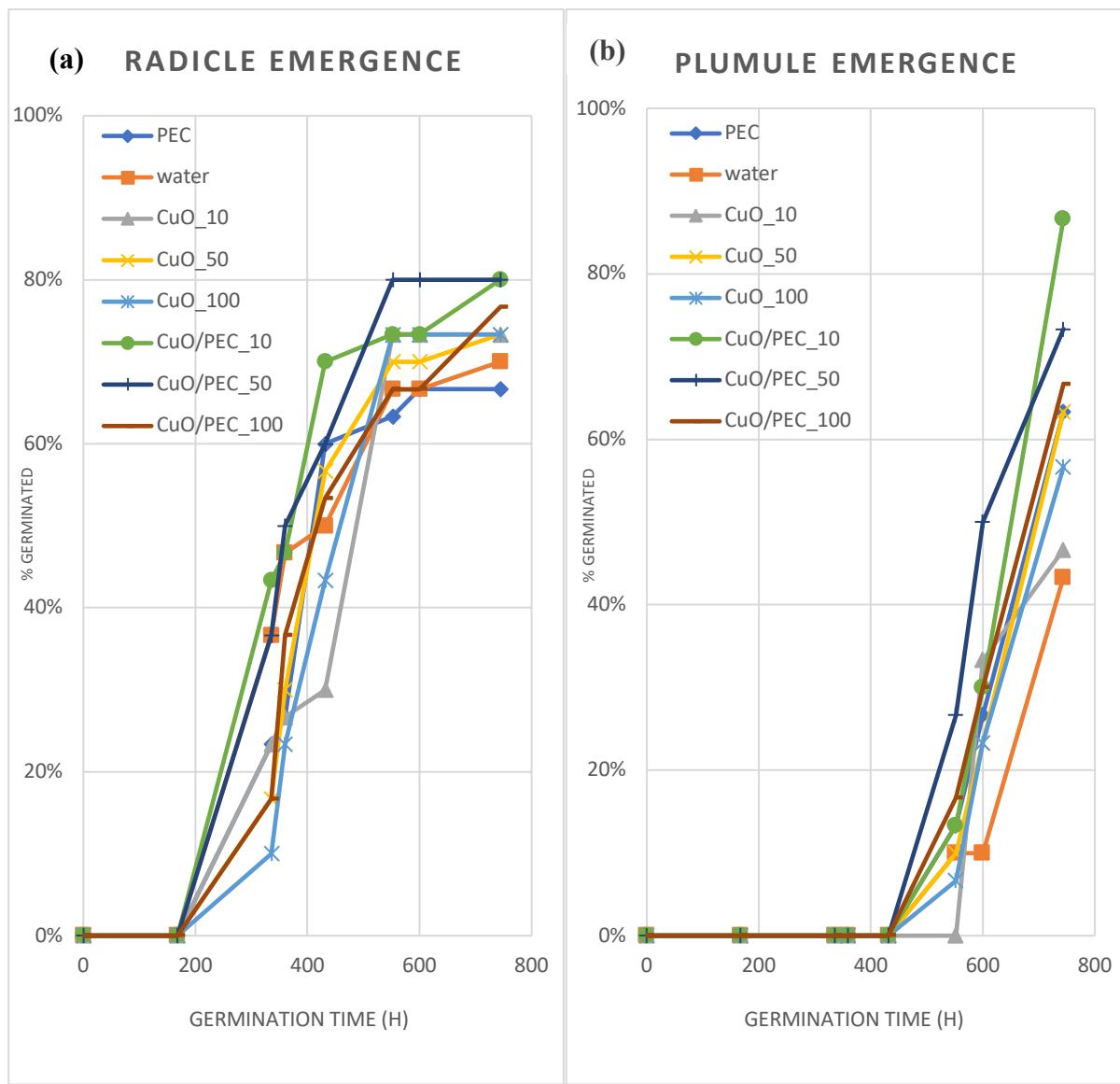


Fig. 4S Effect of application of different concentrations of CuO and CuO/PEC solutions on radicle (a) and plumule (b) emergence of *Fortunella margarita* Swingle seeds. Water and only PEC were reported as control.

Treatment	G (%)	\bar{t} (day)	CVt (%)	\bar{v} (day-1)	U (bit)	Z
water	70.00±0	17.29±1.65	28.32±7.77	0.06±0.01	1.40±0.04	0.32±0.03
PEC	66.67±5.77	17.10±1.58	19.46±3.21	0.06±0.01	1.34±0.07	0.36±0.04
CuO_10	73.33±5.77	19.54±2.79	26.86±17.92	0.05±0.01	0.95±0.40	0.50±0.19
CuO_50	73.33±20.82	18.14±0.70	25.93±11.72	0.06±0	1.68±0.15	0.19±0.10
CuO_100	73.33±20.82	18.73±1.98	21.73±5.15	0.05±0.01	1.30±0.55	0.30±0.13
CuO/PEC_10	80.00±10.00	17.00±2.05	32.72±5.20	0.06±0.01	1.33±0.51	0.37±0.16
CuO/PEC_50	80.00±10.00	16.85±2.22	21.93±6.01	0.06±0.01	1.43±0.25	0.34±0.10
CuO/PEC_100	76.67±15.28	19.04±1.19	30.94±9.58	0.05±0	1.55±0.55	0.28±0.11

Tab. S1. Germination measurements referring to radicles emergence (mean ± standard deviation) of *Fortunella margarita* Swingle seeds, as a response to the application of the different treatments. The reported parameters are G (%), germination percentage; t (day), mean germination time; CVt (%), coefficient of variation of the germination time; v (day-1), mean germination rate; U (bit), uncertainty; Z, synchrony.

Treatment	G (%)	\bar{t} (day)	CVt (%)	\bar{v} (day-1)	U (bit)	Z
water	43.33±15.28 c	29.22±1.54	13.61±3.29	0.03±0	0.07±0.76	0.60±0.35
PEC	46.67±5.77 bc	29.40±1.60	11.72±5.55	0.03±0	0.65±0.36	0.67±0.31
CuO_10	46.67±11.55 bc	26.5±1.50	10.46±3.19	0.04±0	0.48±0.42	0.63±0.32
CuO_50	53.33±11.55 abc	28.89±1.64	13.54±6.95	0.03±0	0.79±0.23	0.56±0.19
CuO_100	53.33±25.17 abc	28.72±0.86	12.82±1.23	0.03±0	0.96±0.22	0.42±0.16
CuO/PEC_10	80±10 a	28.8±1.85	12.97±7.15	0.03±0	0.72±0.48	0.54±0.24
CuO/PEC_50	73.33±11.55 ab	26.19±0.64	13.98±0.31	0.04±0	0.82±0.26	0.14±0.1
CuO/PEC_100	66.67±15.28 abc	27.51±1.88	16.00±2.79	0.04±0	0.66±0.40	0.32±0.24

Tab. S2. Germination measurements referring to plumule emergence (mean ± standard deviation) of *Fortunella margarita* Swingle seeds, as a response to the application of different treatments. Means followed by different letters in each column are significantly different based on the Duncan test at $p\leq 0.05$. The reported parameters are G (%), germination percentage; t (day), mean germination time; CVt (%), coefficient of variation of the germination time; v (day-1), mean germination rate; U (bit), uncertainty; Z, synchrony.