

Differential analysis of three copper-based nanomaterials with different morphologies to suppress *Alternaria alternata* and safety evaluation

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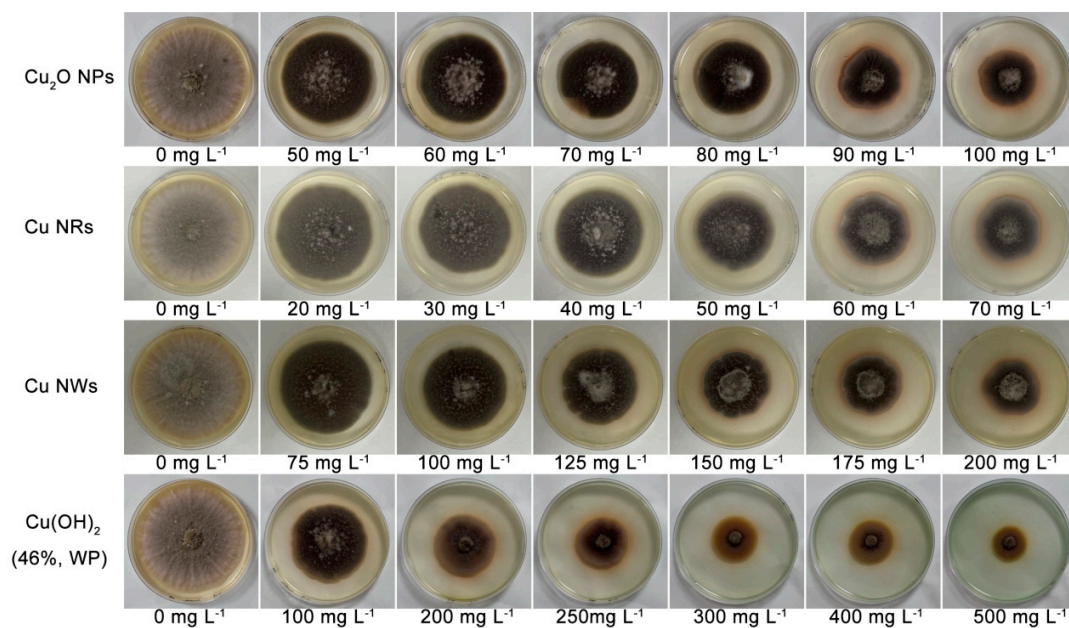


Figure S1. The picture of *A. alternata* colony under blackness cultivation for 7 days with the different concentration of Cu₂O NPs, Cu NRs, Cu NWs and Cu(OH)₂ WP.

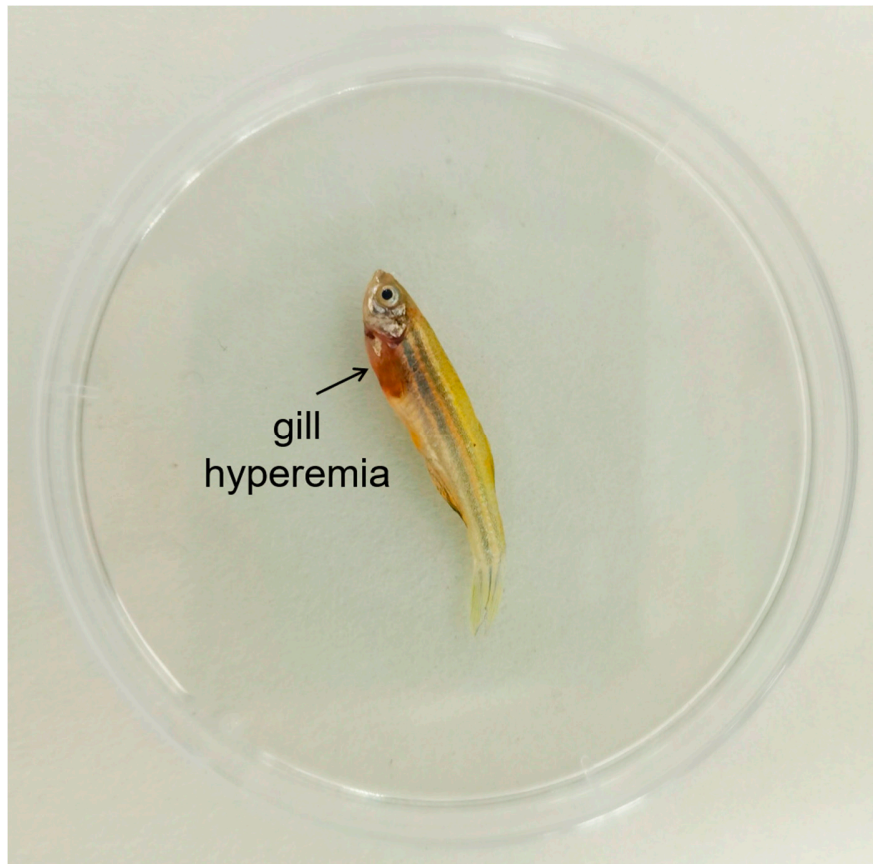


Figure S2. Dead adult zebrafish.

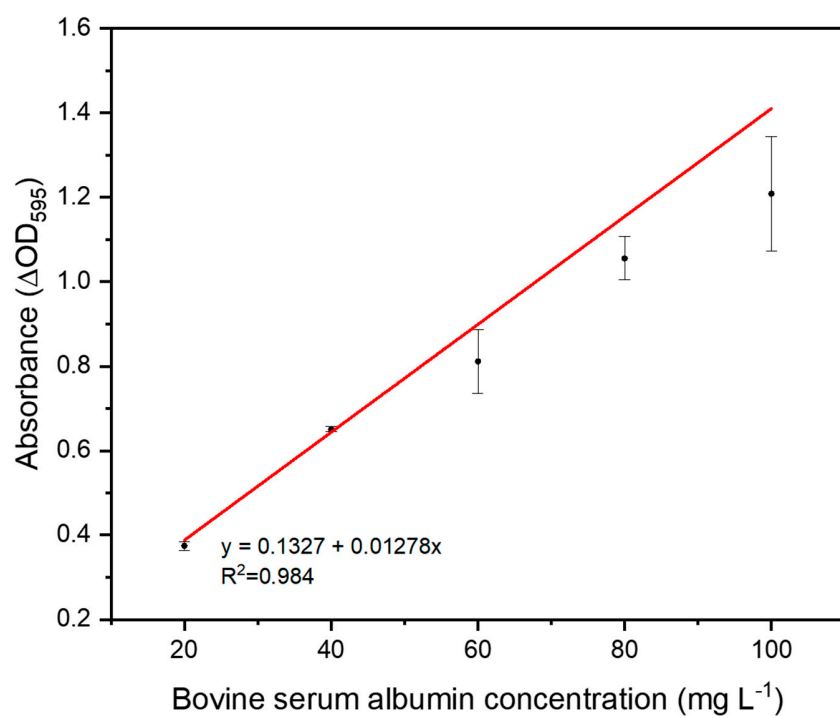


Figure S3. Standard curve of bovine serum protein. Values are means \pm SD, n=3.

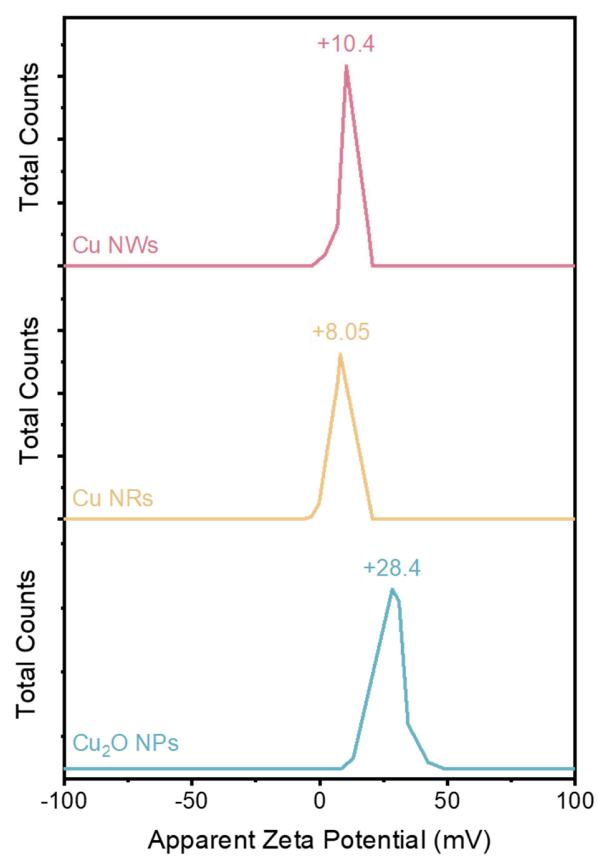


Figure S4. Zeta potential of Cu₂O NPs, Cu NRs and Cu NWs.

Table S1 Mass concentration (active ingredients) of Cu NM and control pesticide for mycelial growth test

Target	Concentration of mother liquor (mg L ⁻¹)	Final Concentration (mg L ⁻¹)					
		1	2	3	4	5	6
Cu ₂ O NPs	1000	50	60	70	80	90	100
Cu NRs	1000	20	30	40	50	60	70
Cu NWs	2000	75	100	125	150	175	200
Cu(OH) ₂ (WP)	5000	100	200	250	300	400	500

Table S2 Mass concentration of Cu NMs for acute toxicity testing in adult zebrafish

Target	Exposure Concentration (mg L ⁻¹)					
	1	2	3	4	5	6
Cu ₂ O NPs	2.0	4.0	5.0	6.0	8.0	10.0
Cu NRs	0.2	0.4	0.5	0.6	0.8	1.0
Cu NWs	0.5	0.8	1.1	1.4	1.7	2.0

Table S3 The bioactivity of Cu NMs and Copper Hydroxide (WP) to *A. alternata*.

Target	Regression equation	EC ₅₀ (mg L ⁻¹)	95% confidence limit (mg L ⁻¹)	R ²	χ^2
Cu ₂ O NPs	y = -6.26+3.1x	104.24	96.64-126.52	0.936	2.361
Cu NRs	y = -5.4+2.77x	89.40	75.38-114.14	0.992	0.515
Cu NWs	y = -5.99+2.67x	166.88	157.45-202.19	0.978	1.143
Cu(OH) ₂ (WP)	y = -3.07+1.36x	171.87	135.01-214.02	0.953	1.702