

Figure S1. FT-IR spectrum of $\text{Ca(OH)}_2\text{@OAm NPs}$.

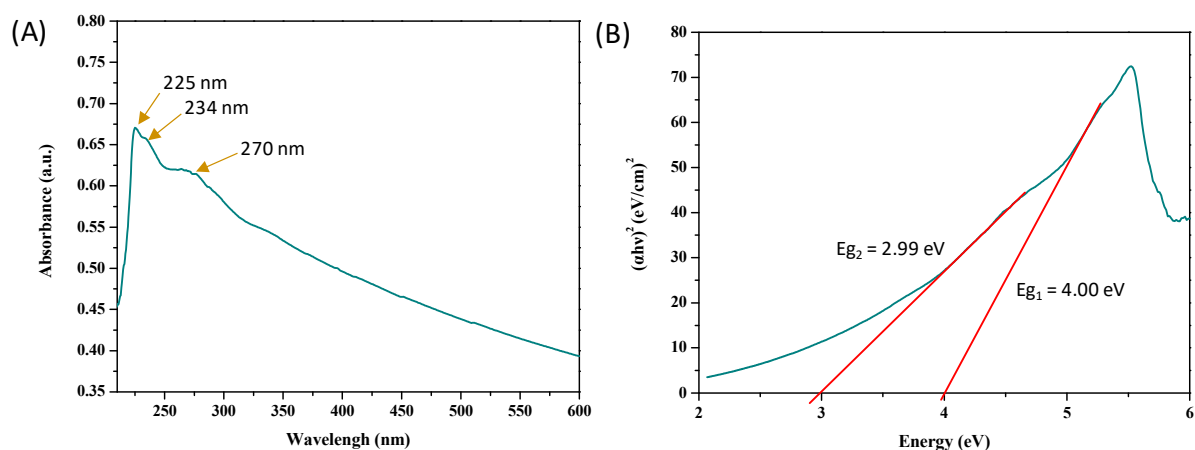


Figure S2. Absorption spectra as a function of wavelength (210–600 nm) (A), and Tauc plots of $(\alpha h\nu)^2$ vs $h\nu$ with linear relationship (B) for $\text{Ca(OH)}_2\text{@OAm NPs}$ in ethanol/water solution.

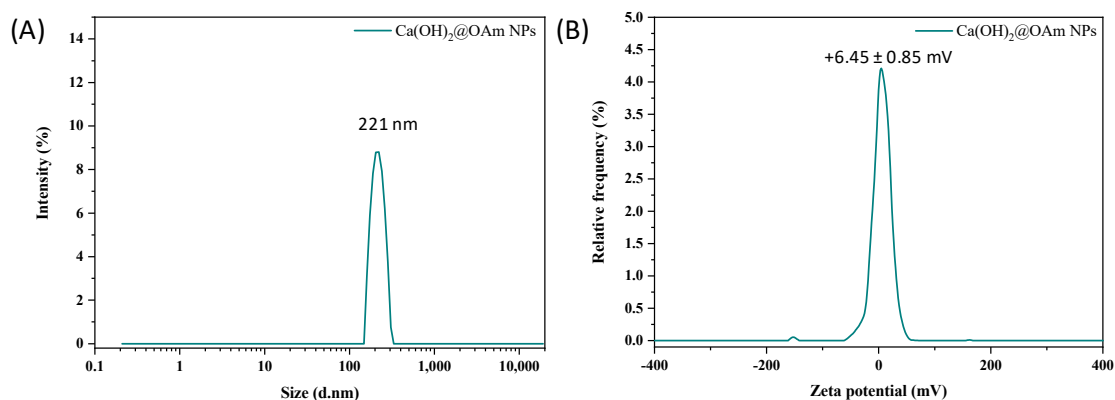


Figure S3. Hydrodynamic diameter distribution measured by DLS and ζ -potential for $\text{Ca(OH)}_2\text{@OAm NPs}$ suspension.

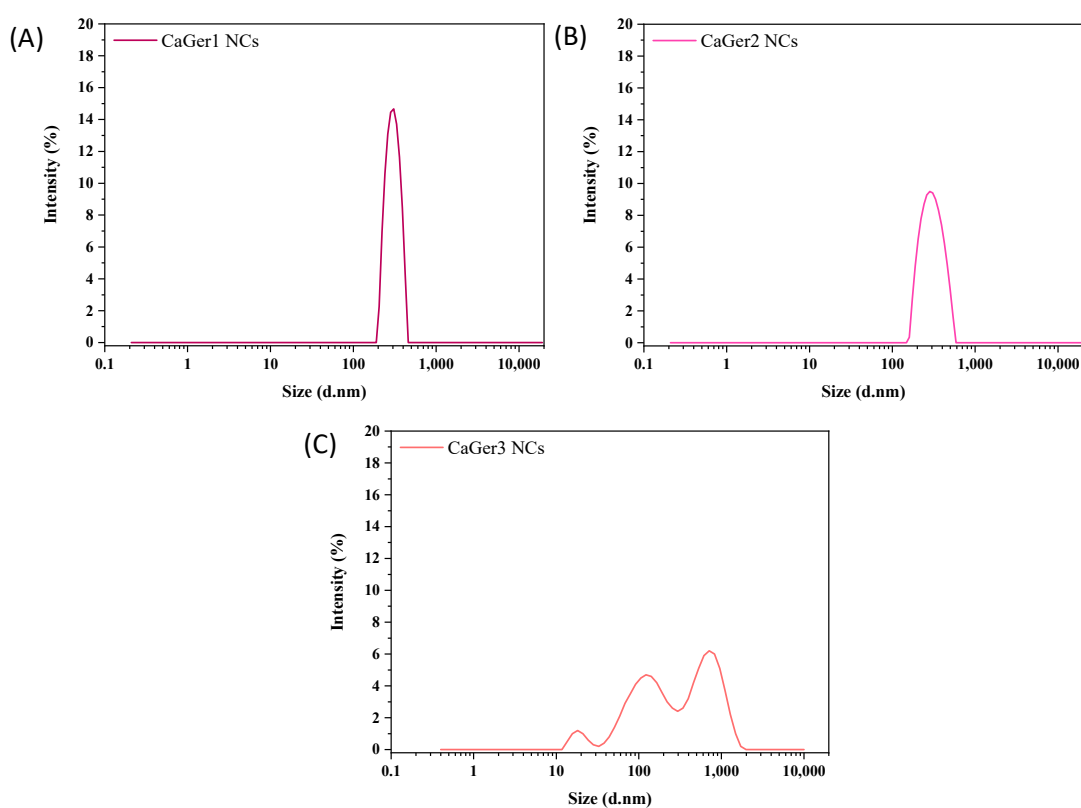


Figure S4. Hydrodynamic diameter distribution was measured by DLS for supernatant of CaGer1 NCs (A), CaGer2 NCs (B), and CaGer3 NCs (C) at 25 °C.

Table S1. The values (R^2 , K_H , n) for the pH-dependent release profiles of CaGer2 NCs are determined using mathematical models; zero-order, first-order, Higuchi, and Korsmeyer-Peppas. The measurements were performed under 25 °C and different pH values (9.2, 7.2, and 5.2) in triplicate.

	Zero-order	First-order	Higuchi		Korsmeyer-Peppas	
pH values	R^2	R^2	R^2	K_H	R^2	n
9.2	0.952	0.965	0.965	6.427	0.952	0.615
7.2	0.741	0.787	0.949	5.690	0.911	0.368
5.2	0.675	0.730	0.914	5.543	0.895	0.334

Table S2. The values (R^2 , K_H , n) for the pH-dependent release profiles of CaGer2 NCs are derived using mathematical models; zero-order, first-order, Higuchi, and Korsmeyer-Peppas. The measurements were performed at 35 °C and under different pH values (9.2, 7.2, and 5.2) in triplicate.

pH values	Zero-order	First order	Higuchi		Korsmeyer-Peppas	
	R^2	R^2	R^2	K_H	R^2	n
9.2	0.780	0.844	0.893	4.88	0.943	0.354
7.2	0.683	0.776	0.831	5.23	0.845	0.361
5.2	0.891	0.953	0.926	7.24	0.960	0.486

Table S3. Dynamic Light Scattering Analysis and ζ -potential values of CaGer2 NCs at pH 5.2 and 9.2.

Nanocapsule formulations	DLS (nm)	PDI	ζ -potential (mV)
CaGer2 NCs (pH = 5.2)	287 \pm 2.7	0.106	-31.5 \pm 1.21
CaGer2 NCs (pH = 9.2)	312 \pm 1.8	0.183	-41.3 \pm 1.05

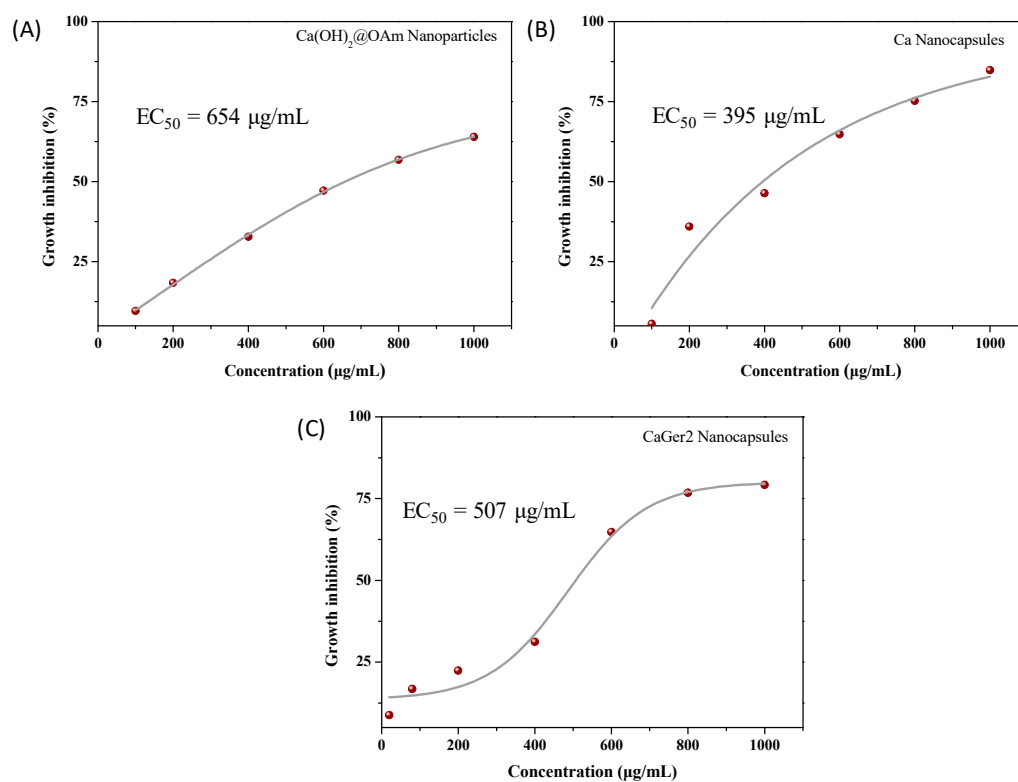


Figure S5. Dose–response growth inhibition curves of *B. cinerea* in response to varying concentrations of Ca(OH)₂@OAm Nanoparticles (A), Ca Nanocapsules (B), and CaGer2 Nanocapsules (C). Each data point represents the mean from ten replicates per nanoformulation concentration (2 experiments, 5 replications) 96 hours after application.