Supplementary Information

Waste-Derived Chlorogenic-Acid Ag Nanozyme for Nanomolar Dopamine Sensing in Pharmaceutical Formulations

Fig S1: *Musa balbisiana* fermentation waste, dried and ground.

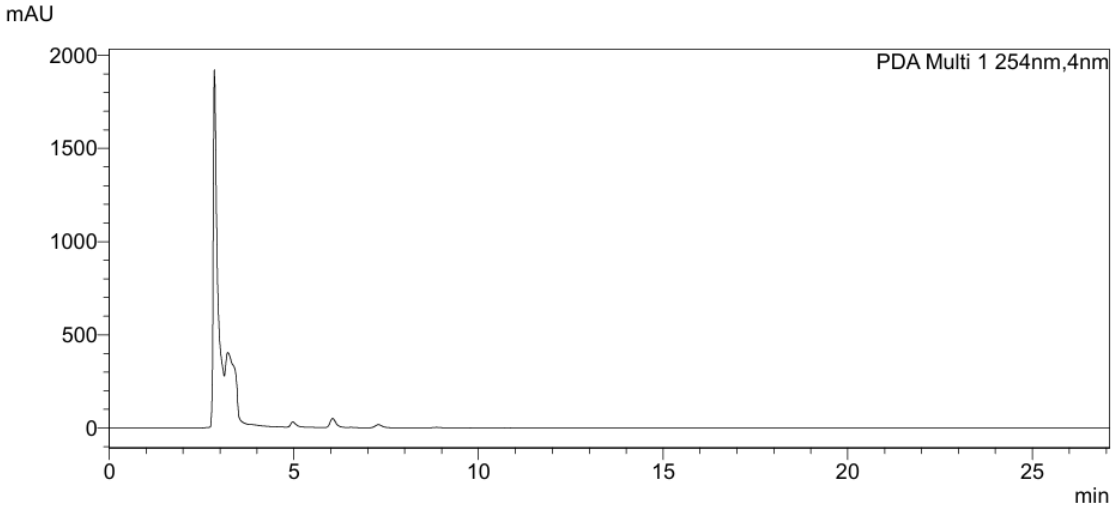


Fig S2: HPLC chromatogram of standard CGA showing peak at retention time 2.84 min in a binary solvent system composed of acetic acid and acetonitrile, with a ratio of A:B of 30 : 70.

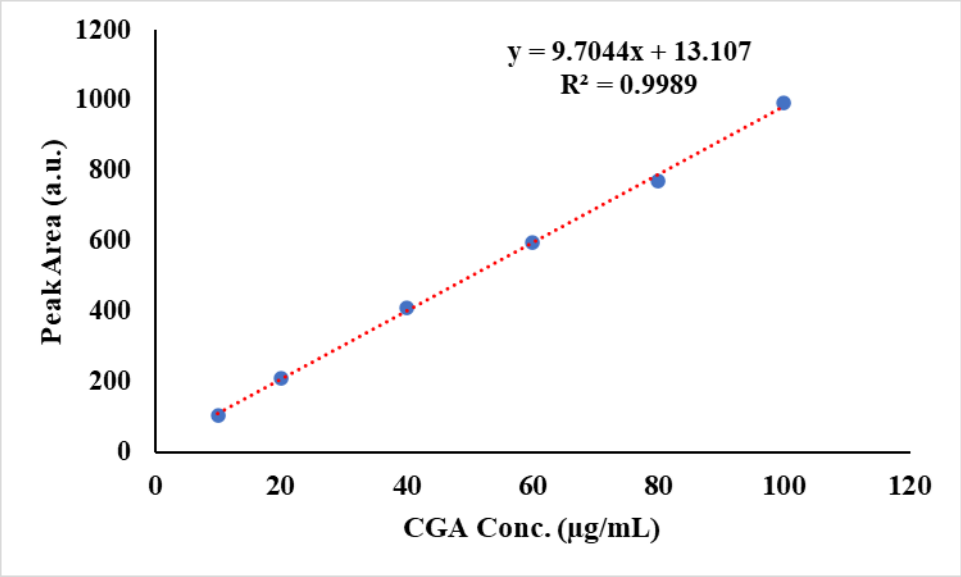


Fig S3: Calibration curve of chlorogenic acid standard obtained by plotting peak area versus concentration (10–100 µg/mL). The curve shows excellent linearity with regression equation y = 9.7044x + 13.107 and correlation coefficient (R^2 = 0.9989).

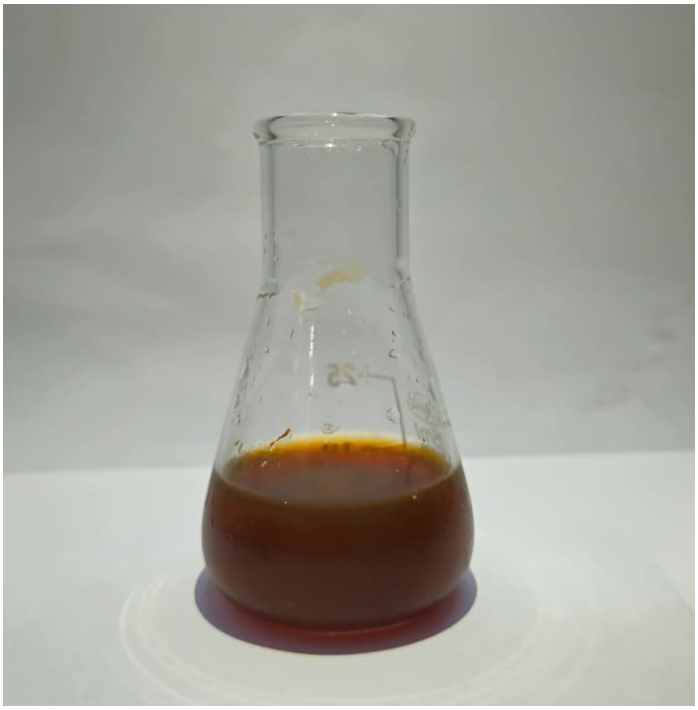
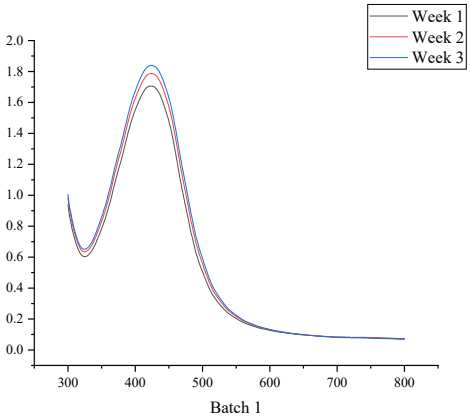
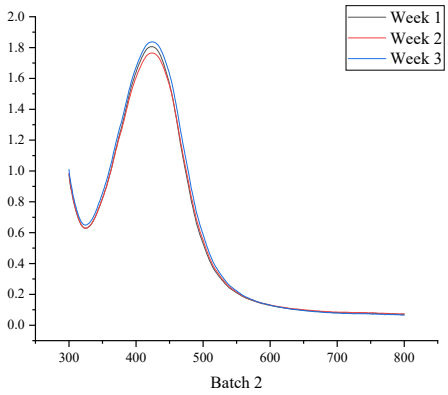


Fig S4: BK-AgNPs solution prepared using aqueous extract of *Musa balbisiana* fermentation waste.



Batch 1



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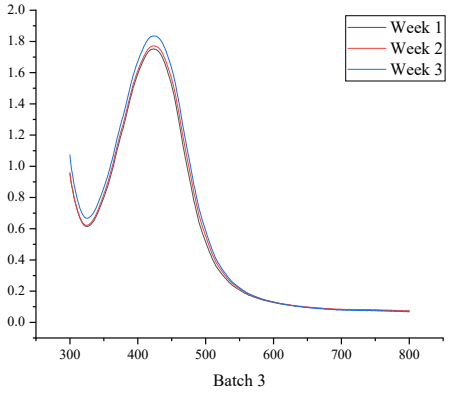

Batch 3

Fig S5: Shelf-life stability study of BK-AgNPs

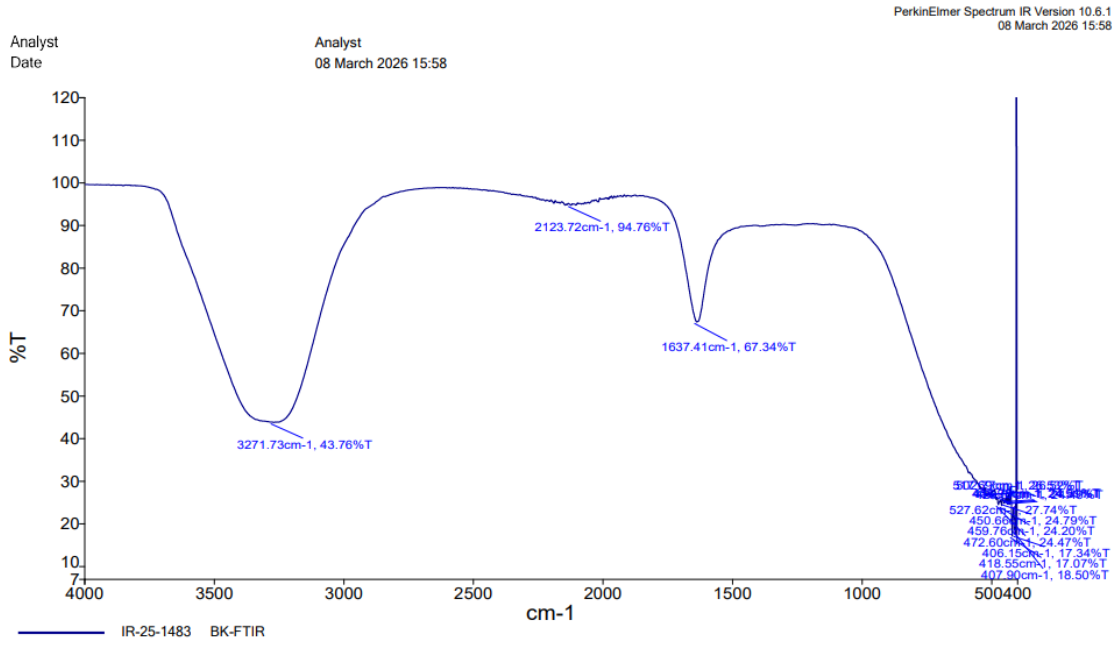

Fig S6: FTIR Spectrum of BK-AgNPs

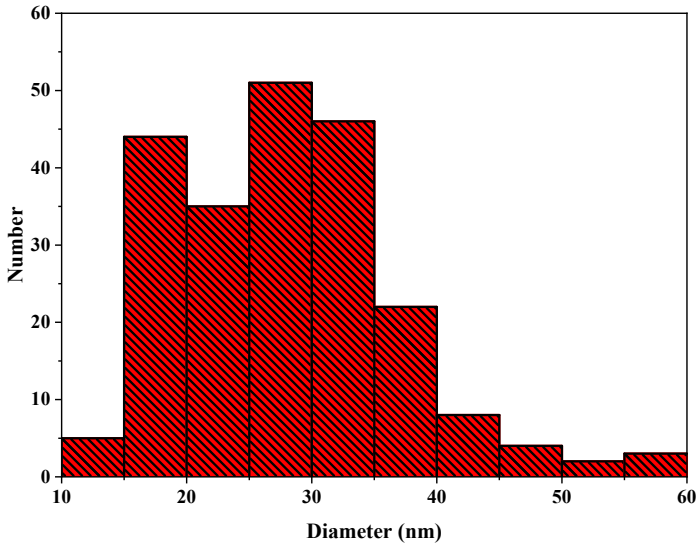

Fig S7(a): Particle size distribution histogram of nanoparticles obtained synthesized from TEM images.

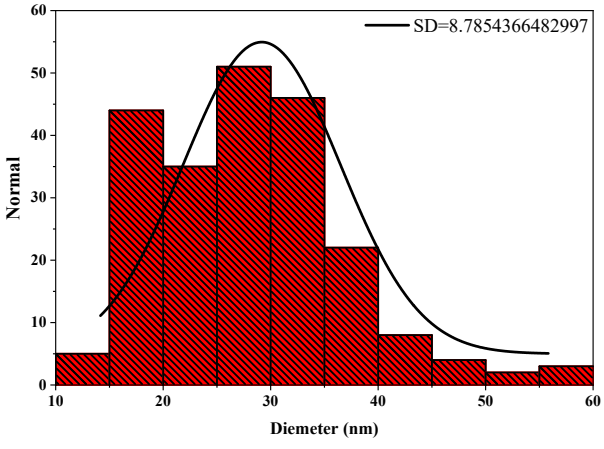

Fig S7(b): TEM particle size distribution with normal fit.

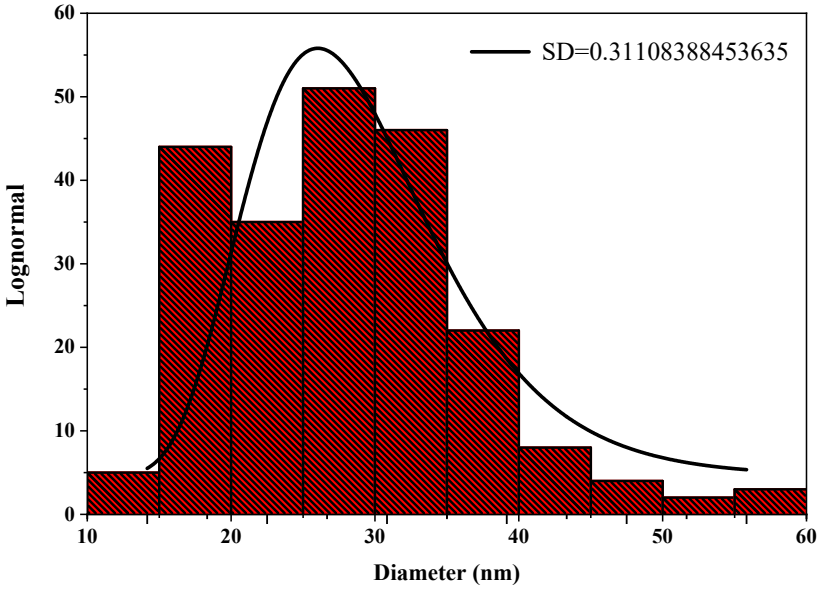

Fig S7(c): TEM particle size distribution with log-normal fit.

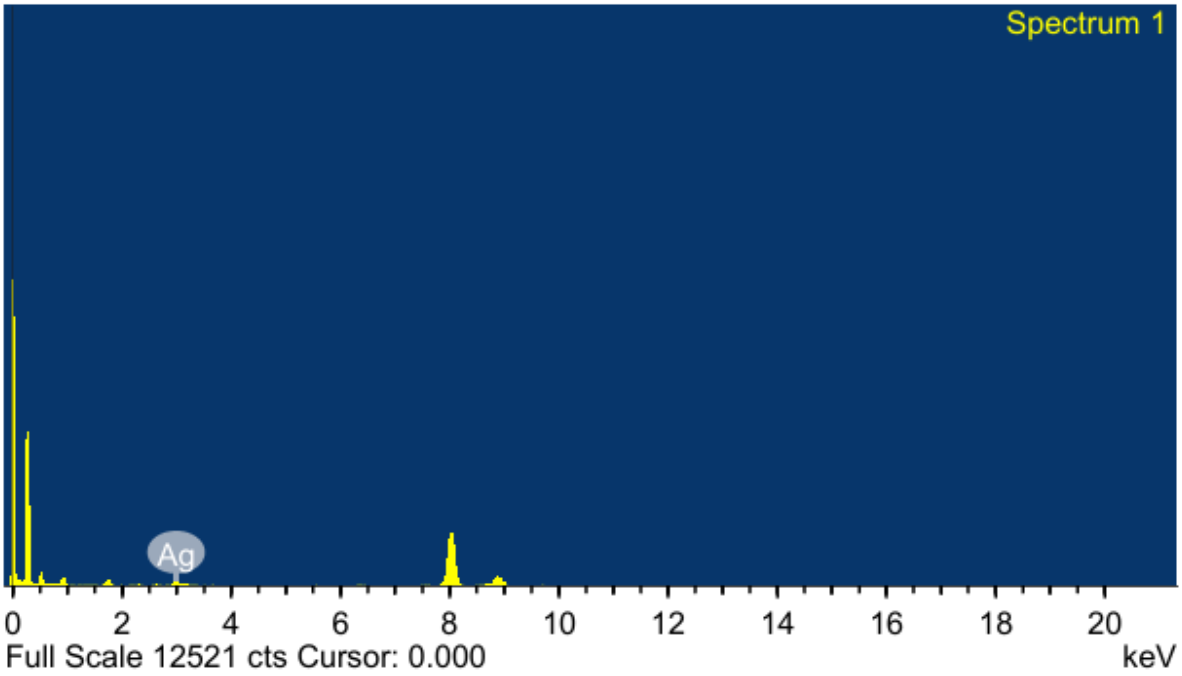

Fig S8: SEM-EDX spectrum of BK-AgNPs. Peaks possibly omitted at 0.933, 1.745, 2.320, 8.033, 8.896, 9.740 keV respectively.

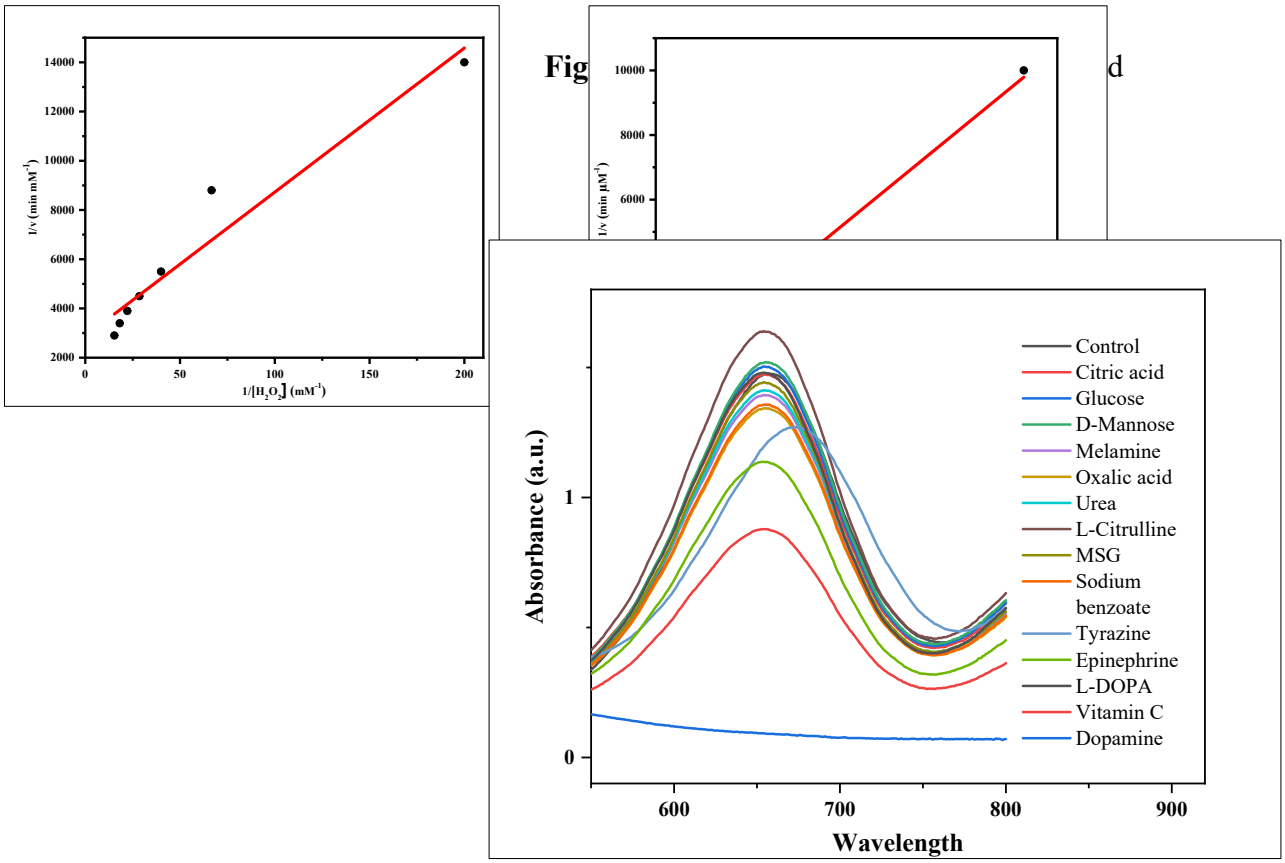

Fig S10: Selectivity of DA in presence of other interference.

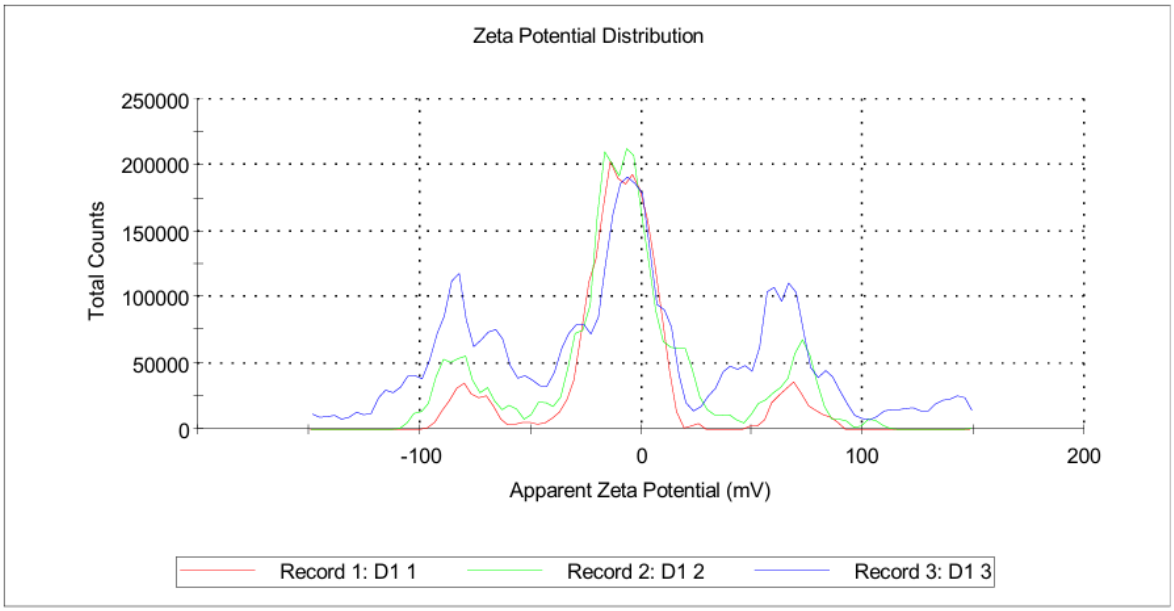

Fig S11: Zeta potential distribution of BK-AgNPs (Z1) at 25 °C.

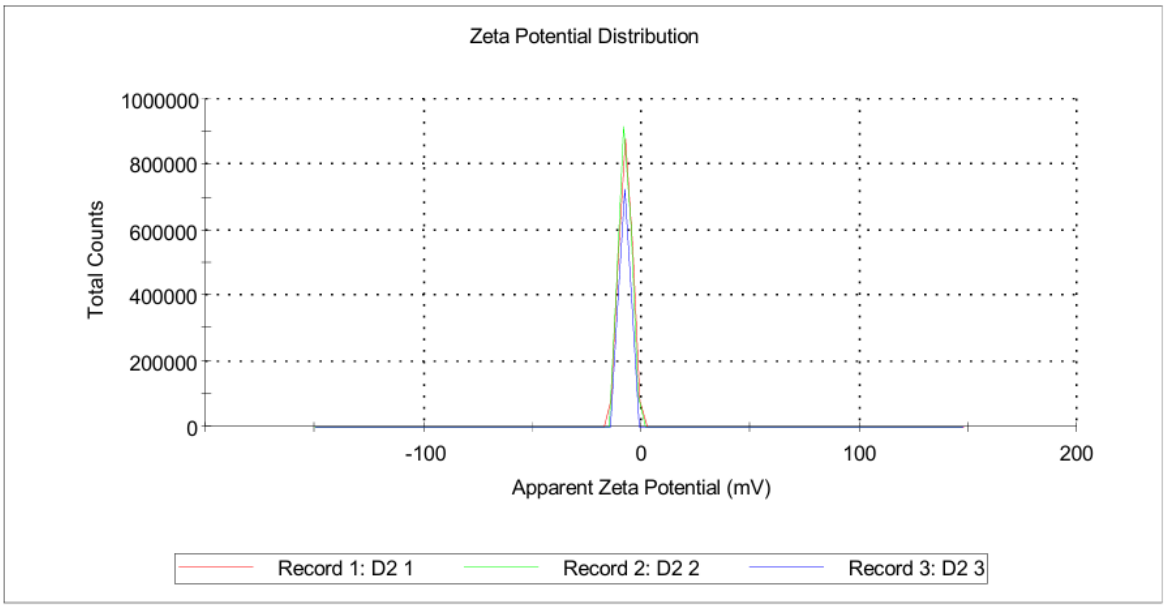

Fig S12: Zeta potential distribution of nanozyme solution (Z2) at 25 °C.

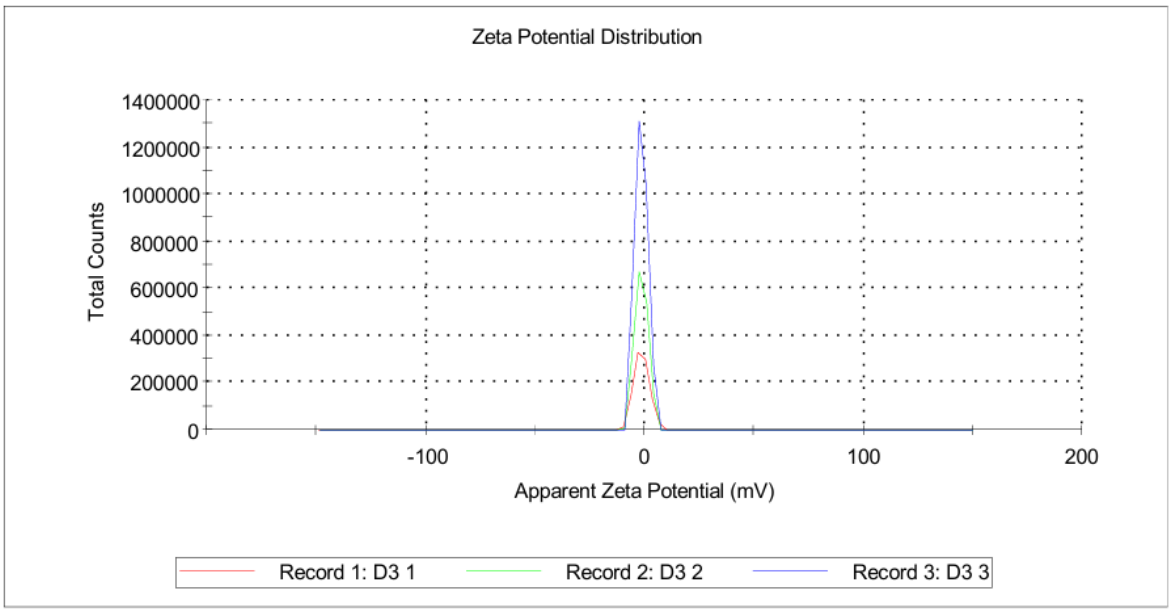

Fig S13: Zeta potential distribution of nanozyme + DA (Z3) at 25 °C.

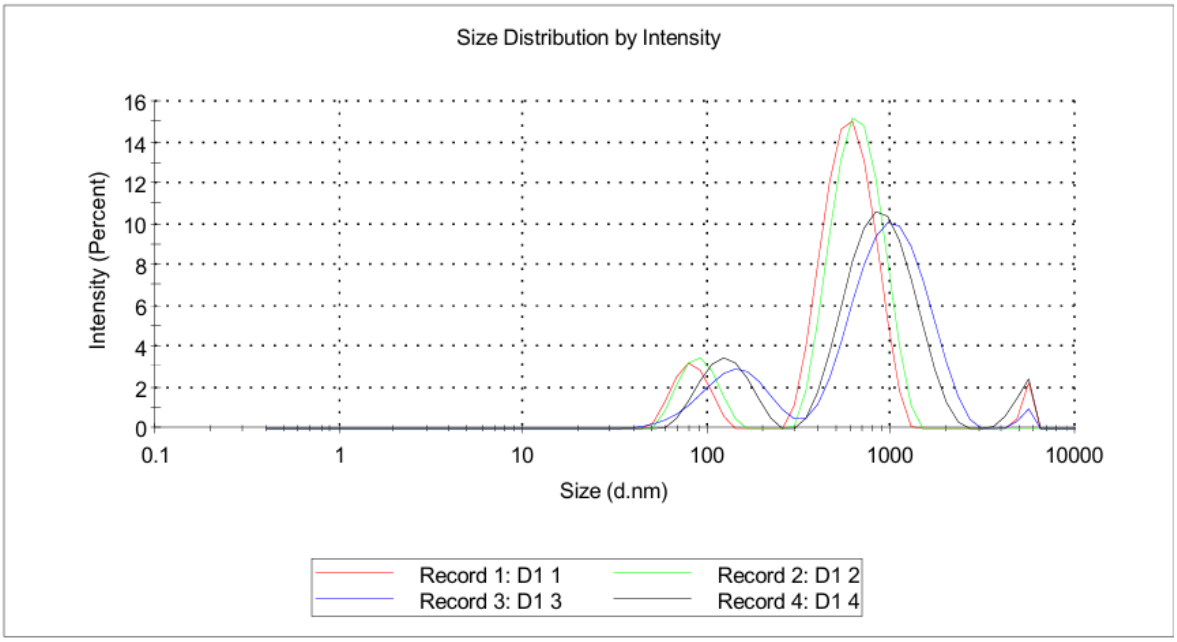

Fig S14: Hydrodynamic size distribution of BK-AgNPs (D1) at 25 °C.

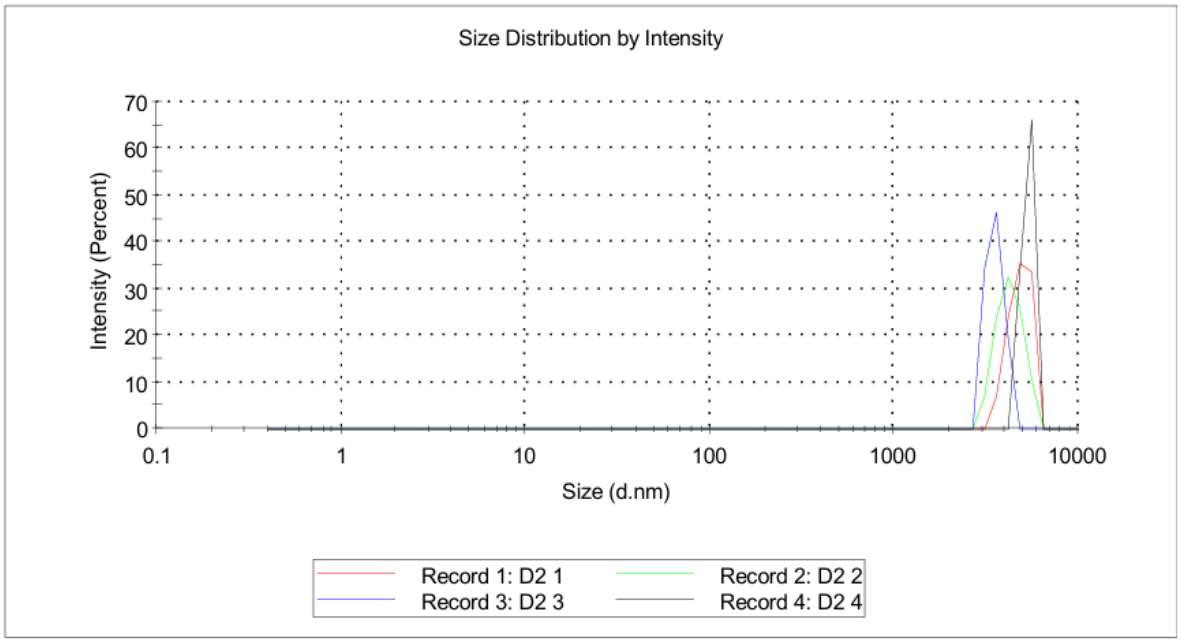

Fig S15: Hydrodynamic size distribution of nanozyme solution (D2) at 25 °C.

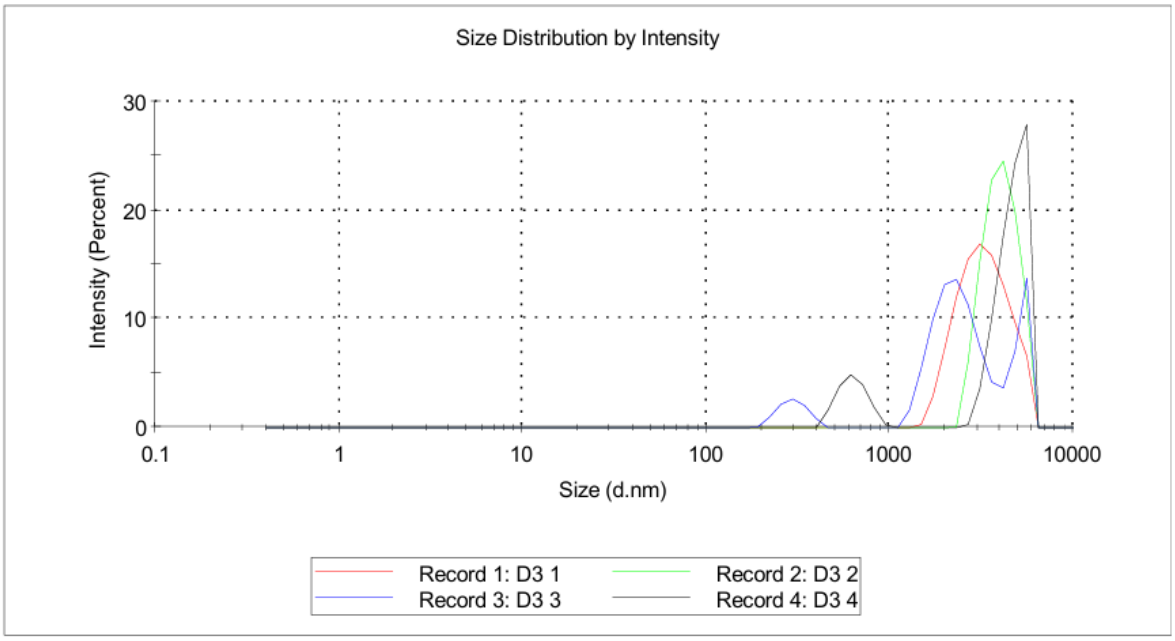

Fig S16: Hydrodynamic size distribution of nanozyme + DA (D3) at 25 °C.

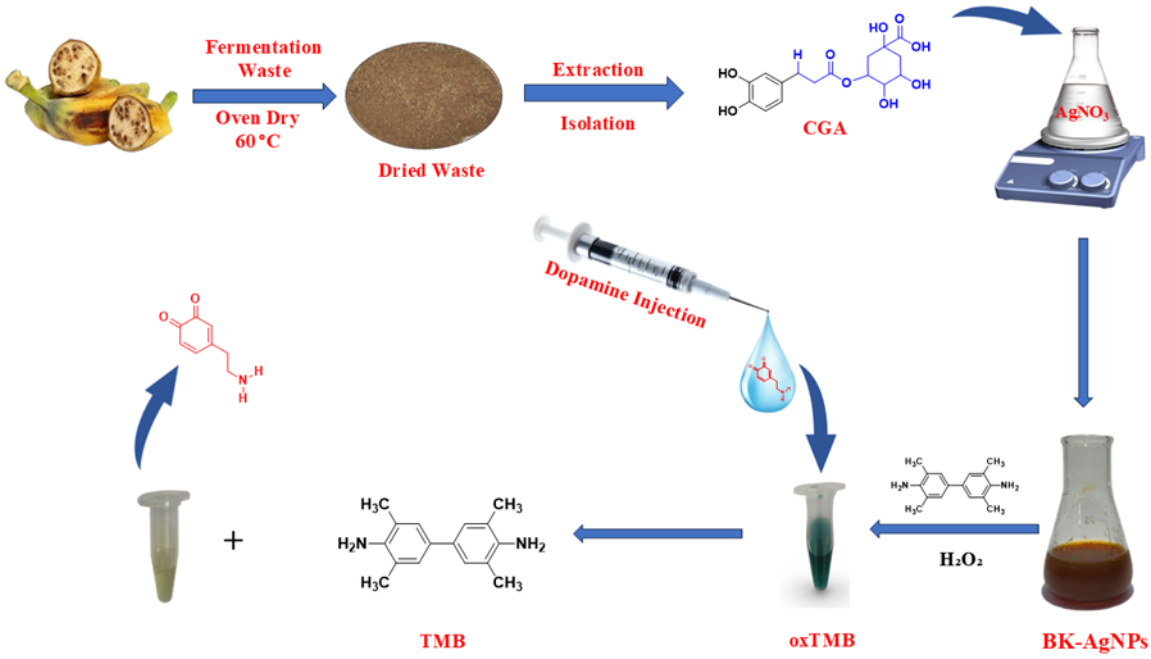

Fig S17: Schematic representation of the colorimetric sensing of pharmaceutical DA using BK-AgNPs.

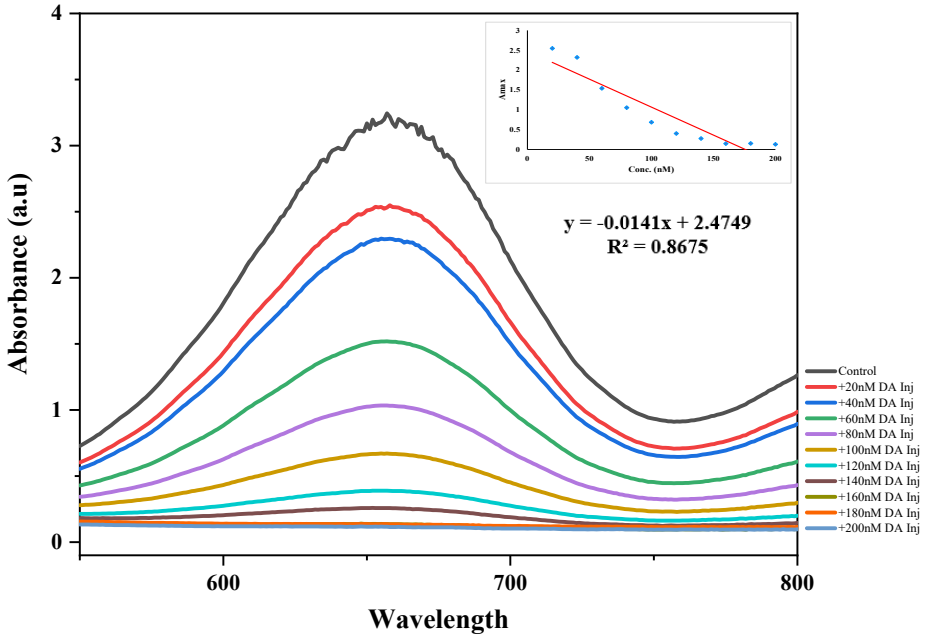

Fig S18: Colorimetric detection in series of concentrations of commercially available DA injection using peroxidase mimetic nanozyme of BK-AgNPs.

Table S1: Quantitative HPLC validation of the HPLC-isolated chlorogenic acid (CGA) fraction from *Musa balbisiana* wine waste (purity, recovery and precision parameters).

Parameter	***Value***
Linearity (R^2)	0.9989
Purity (%)	92.3
Recovery (%)	96-97
RSD (%)	2.1

Table S2: Fitted K_m and V_{max} values

Substrate	**Km**	**Vmax**
TMB	3.25 mM	5.53×10^{-4}
H_2O_2	0.072 mM	6.84×10^{-4}

Table S3: Zeta potential, electrophoretic mobility and conductivity of BK-AgNPs and reaction mixtures.

Sample	***Zeta Potential (mV)***	***Mean ± SD (mV)***	***Mobility (µm cm/V s)***	***Conductivity (mS/cm)***
Z1	–8.33, –7.44, –8.25	–8.01 ± 0.48	–0.6531 to –0.6466	4.30–5.49
Z2	–7.29, –7.47, –7.59	–7.45 ± 0.15	–0.5713 to –0.5948	1.13–1.25
Z3	–1.32, –1.38, –1.41	–1.37 ± 0.05	–0.1032 to –0.1105	0.0096–0.0145

Table S4: Hydrodynamic size and polydispersity of BK-AgNPs and reaction mixtures by DLS.

Sample	*Z-Average (d.nm)*	*Mean ± SD (d.nm)*	*PdI*	*Major Peak (d.nm)*	*Major Peak (d.nm)*	*Minor Peaks (d.nm, %)*
D1	437.6–504.3	474.6 ± 29.6	0.526–0.779	611–1068	76.9–85.4	~80–145 nm (12–20%), >5 µm (1–5%)
D2	4460–6406	5444 ± 846	0.240–0.579	3521–5302	100	-
D3	2913–3631	3283 ± 309	0.232–0.399	2390–4688	68–100	~0.63 µm (16.3% in one run)