

Supplementary information

Improving *in vitro* bioaccessibility and bioactivity of carnosic acid using lecithin-based nanoemulsion system

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SI-Table 1. The droplet size and polydispersity index (PDI) of carnosic acid nanoemulsion under different pH conditions

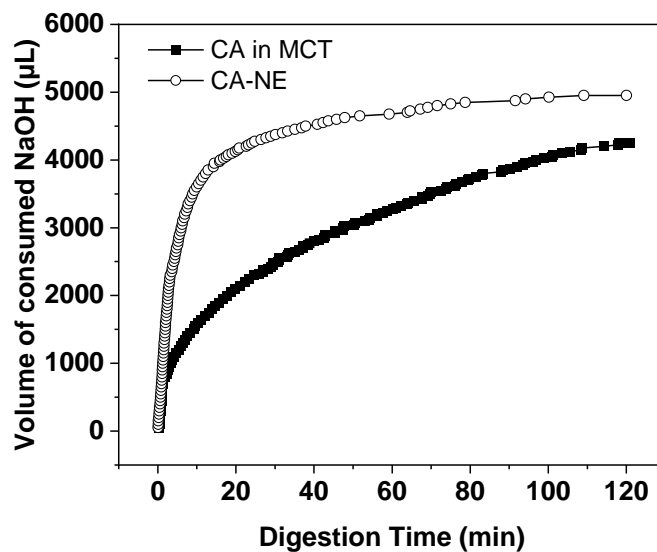
Storage Time (Days)	Droplet size (nm) and PDI under different pH					
	4	6.2	7.4	8	10	
1	Size	173.8±1.00 ^{ca}	177.5±1.69 ^{bcA}	183.4±1.06 ^{aA}	178.8±1.34 ^{ba}	181.2±0.74 ^{abA}
	PDI	0.205±0.012 ^{aA}	0.211±0.018 ^{aA}	0.192±0.018 ^{aA}	0.205±0.014 ^{aA}	0.186±0.009 ^{aA}
2	Size	172.0±0.46 ^{ba}	167.2±1.00 ^{cC}	181.5±1.15 ^{aA}	171.3±0.92 ^{bcB}	168.4±0.95 ^{cC}
	PDI	0.205±0.021 ^{aA}	0.202±0.020 ^{aA}	0.197±0.021 ^{aA}	0.200±0.023 ^{aA}	0.188±0.015 ^{aA}
3	Size	173.8±1.50 ^{bcA}	172.4±1.47 ^{cb}	179.4±1.01 ^{aA}	175.4±2.07 ^{abAB}	177.5±1.35 ^{abB}
	PDI	0.215±0.016 ^{aA}	0.204±0.014 ^{aA}	0.175±0.018 ^{aA}	0.186±0.019 ^{aA}	0.196±0.022 ^{aA}
5	Size	170.9±1.27 ^{bb}	171.5±0.90 ^{bb}	180.5±0.71 ^{aA}	173.3±1.02 ^{bb}	180.6±0.86 ^{aAB}
	PDI	0.234±0.024 ^{aA}	0.231±0.015 ^{aA}	0.181±0.010 ^{aA}	0.211±0.031 ^{aA}	0.201±0.018 ^{aA}
7	Size	172.1±1.84 ^{bb}	172.2±0.41 ^{bb}	180.1±2.05 ^{aA}	174.7±1.59 ^{baB}	179.9±0.77 ^{aAB}
	PDI	0.221±0.022 ^{aA}	0.221±0.016 ^{aA}	0.179±0.021 ^{aA}	0.187±0.009 ^{aA}	0.200±0.021 ^{aA}

Values are means ± SD (n = 3). Different superscript of small letter indicates a significant difference for the same row for the same property ($p < 0.05$), different superscript of capital letter indicates a significant difference for the same column for the same property ($p < 0.05$).

SI-Table 2. The droplet size and polydispersity index (PDI) of carnosic acid nanoemulsion under different ionic strength

Storage Time (Days)		Droplet size (nm) and PDI under different ionic strength (mM)			
		0	5	10	50
1	Size	173.0±1.63 ^{bB}	165.6±1.34 ^{bB}	165.5±1.26 ^{bC}	233.2±12.02 ^{aD}
	PDI	0.204±0.024 ^{aA}	0.213±0.016 ^{aA}	0.191±0.016 ^{aA}	0.241±0.031 ^{aA}
2	Size	177.1±1.23 ^{bAB}	174.5±1.60 ^{bcA}	170.8±1.64 ^{cb}	284.6±2.74 ^{aC}
	PDI	0.211±0.015 ^{bA}	0.224±0.015 ^{abA}	0.223±0.019 ^{abA}	0.278±0.023 ^{aA}
3	Size	182.9±2.16 ^{bA}	175.7±2.73 ^{bA}	174.9±2.30 ^{bAB}	322.0±16.57 ^{aBC}
	PDI	0.200±0.025 ^{aA}	0.213±0.020 ^{aA}	0.207±0.018 ^{aA}	0.282±0.055 ^{aA}
5	Size	176.9±1.74 ^{bAB}	173.9±0.90 ^{bA}	176.6±1.31 ^{bA}	361.4±18.09 ^{aB}
	PDI	0.186±0.014 ^{bA}	0.211±0.021 ^{bA}	0.191±0.013 ^{bA}	0.311±0.041 ^{bA}
7	Size	174.7±2.56 ^{bB}	175.8±0.95 ^{bA}	172.6±1.23 ^{bAB}	452.4±5.60 ^{aA}
	PDI	0.211±0.017 ^{aA}	0.212±0.025 ^{aA}	0.209±0.019 ^{aA}	0.287±0.029 ^{bA}

Values are means ± SD (n = 3). Different superscript of small letter indicates a significant difference for the same row for the same property ($p < 0.05$), different superscript of capital letter indicates a significant difference for the same column for the same property ($p < 0.05$).



SI-Figure 1. Comparison of in vitro lipolysis of CA in MCT oil and CA-NE. The volume of NaOH consumed during the in vitro lipolysis as a function of time.

SI-Table 3. Dose-CAA value and the EC₅₀ value of carnosic acid (CA) and carnosic acid nanoemulsion (CA-NE) (n=3)

	Conc.(uM)	Carnosic acid			CA-NE		
		Repeat 1	Repeat 2	Repeat 3	Repeat 1	Repeat 2	Repeat 3
CAA value	20	55.0±5.4	62.9±1.1	63.5±4.0	43.8±6.9	51.1±0.6	43.8±2.9
	10	45.7±6.9	38.8±2.1	40.7±2.9	27.1±4.3	30.1±1.7	25.6±3.0
	5	38.1±3.7	28.3±0.7	20.1±3.5	22.6±3.5	21.5±3	23.6±1.7
	1	26.5±6.7	5.2±3.8	6.7±4.1	5.8±0.9	9.1±1.9	5.2±0.8
EC₅₀ (μM)		14.12	13.02	14.00	27.54	24.32	26.92
Average							
EC₅₀ (μM)			13.71±0.60			26.26±1.71	