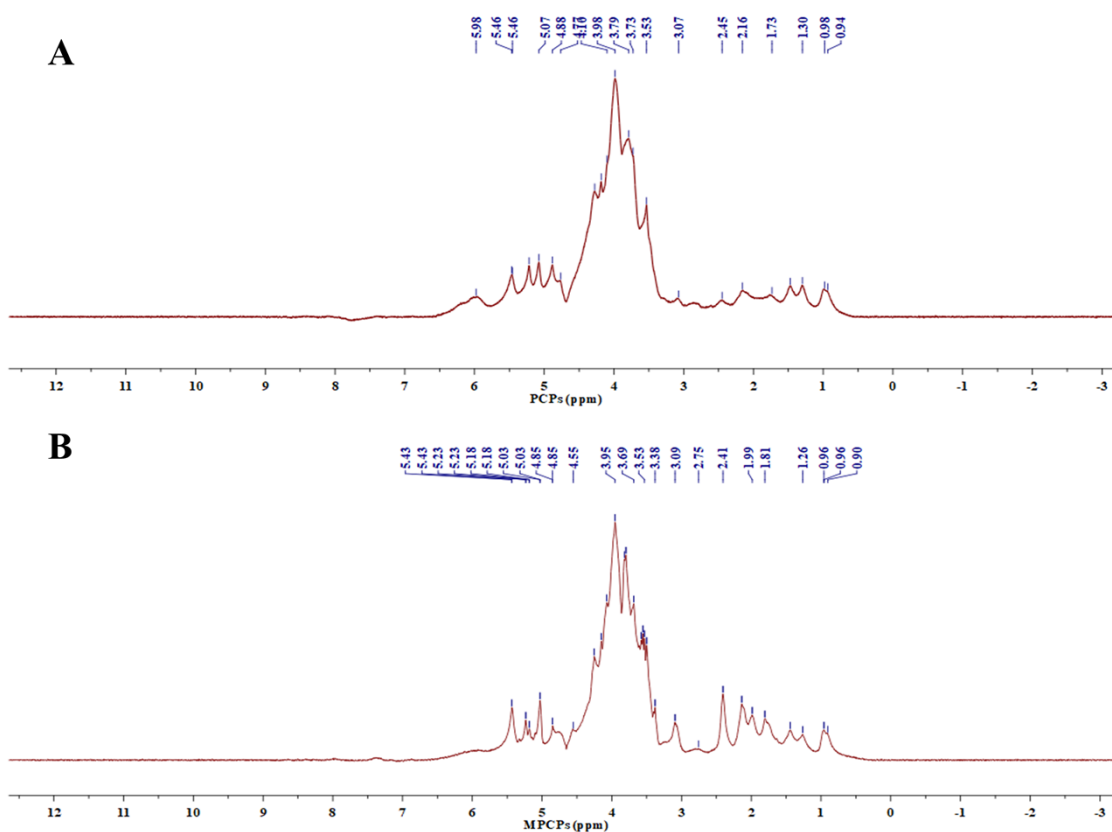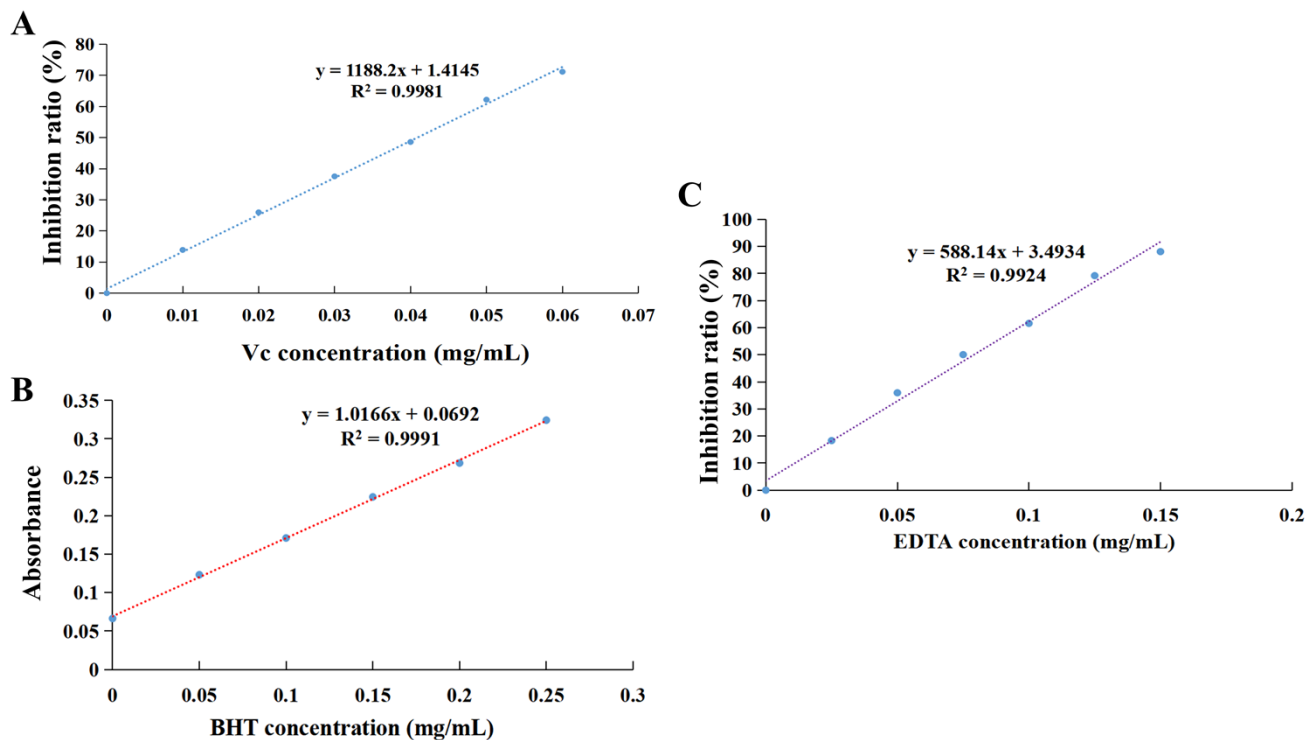1   **Supplementary Materials**

2   **Fig. S1** The analysis of ¹H NMR for PCPs (A) and MPCPs (B)

3

4 **Fig. S2** The standard curve for the antioxidant activities of the positive control (A)

5 Vitamin C (Vc) standard curve; (B) 2,6-di-*tert*-butyl-4- methylphenol (BHT) standard

6 curve; (C) Ethylenediamine tetraacetic acid (EDTA) standard curve

A

$y = 1188.2x + 1.4145$
$R^2 = 0.9981$

Inhibition ratio (%) vs Vc concentration (mg/mL)

B

$y = 1.0166x + 0.0692$
$R^2 = 0.9991$

Absorbance vs BHT concentration (mg/mL)

C

$y = 588.14x + 3.4934$
$R^2 = 0.9924$

Inhibition ratio (%) vs EDTA concentration (mg/mL)

7 VC, BHT and EDTA were positive controls for DPPH free radical activity, reducing

8 power and metal chelating power, respectively.

9 **Table S1**

10 Changes in molecular weight (M_w) of PCPs and MPCPs during *in vitro* digestion

Samples	Stage	Peak1 M_w (Da)	M_w/M_n	Areas (%)	Peak2 M_w (Da)	M_w/M_n	Areas (%)	Peak3 M_w (Da)	M_w/M_n	Areas (%)	Peak4 M_w (Da)	M_w/M_n	Areas (%)
PCPs	undigested	3.619×10^6	20.620	2.9	1.375×10^6	1.734	37.5	7.482×10^5	1.479	27.1	4.358×10^5	1.221	32.5
	PCPs-S	4.163×10^6	3.100	2.6	1.404×10^6	1.349	42.8	9.481×10^5	1.077	54.6	ND		
	PCPs-G	3.363×10^6	1.005	3.5	1.294×10^6	1.151	41.1	1.131×10^6	1.065	55.4	ND		
	PCPs-I	3.627×10^6	1.008	3.2	1.356×10^6	1.165	43.5	1.393×10^6	1.054	53.3	ND		
MPCPs	undigested	2.572×10^6	17.199	5.4	1.131×10^6	1.046	47.1	4.159×10^5	1.248	47.5	ND		
	MPCPs-S	2.104×10^6	17.413	1.4	1.020×10^6	1.679	50.0	3.998×10^5	1.033	48.6	ND		
	MPCPs-G	1.847×10^6	6.062	1.7	9.140×10^5	1.523	56.0	4.060×10^5	1.036	42.3	ND		
	MPCPs-I	1.645×10^6	10.524	1.1	1.100×10^6	1.558	58.1	5.010×10^5	1.031	40.8	ND		

11 Undigested, PCPs-S, PCPs-G and PCPs-I in PCPs represent undigested PCPs, saliva-digested, gastric-digested, and intestinal-digested PCPs,

12 respectively. Undigested, MPCPs-S, MPCPs-G and MPCPs-I in MPCPs represent undigested MPCPs, saliva-digested, gastric-digested, and

13 intestinal-digested MPCPs, respectively. ND: not detected.

Table S2

15 Monosaccharide composition of PCPs and MPCPs during *in vitro* stimulated digestion (%)

Samples	Stage	Man	Rib	Rha	GlcA	GalA	Glu	Gal	Xyl	Ara	Fuc
PCPs	undigested	14.41±1.52[c]	3.94±0.98[b]	0.33±0.05[d]	0.08±0.08[b]	0.03±0.03[b]	55.28±2.20[a]	22.97±0.92[d]	0.04±0.00[a]	2.49±0.36[c]	0.43±0.21[c]
	PCPs-S	23.57±0.06[a]	1.57±0.22[c]	0.44±0.04[c]	0.49±0.29[a]	0.17±0.01[a]	34.84±0.27[b]	33.27±0.23[b]	0.46±0.01[c]	4.44±0.01[b]	0.76±0.08[b]
	PCPs-G	21.85±0.27[b]	1.14±0.09[c]	0.71±0.03[b]	0.65±0.08[a]	0.19±0.04[a]	35.25±2.71[b]	35.45±0.07[a]	0.55±0.02[a]	3.55±0.41[b]	0.65±0.17[bc]
	PCPs-I	21.98±0.38[b]	5.77±0.99[a]	1.06±0.08[a]	0.65±0.02[a]	0.17±0.08[a]	35.66±0.51[b]	30.12±0.44[c]	0.51±0.03[b]	2.84±0.00[c]	1.23±0.06[a]
MPCPs	undigested	9.80±0.16[c]	1.56±0.04[c]	0.40±0.04[c]	0.08±0.00[a]	0.06±0.01[a]	78.16±0.34[a]	8.24±0.19[b]	0.04±0.01[b]	1.37±0.04[c]	0.30±0.05[c]
	MPCPs-S	14.29±0.19[a]	4.13±0.01[b]	0.64±0.04[b]	0.07±0.04[a]	0.23±0.20[a]	61.72±2.26[bc]	15.61±1.81[a]	0.61±0.14[a]	2.22±0.18[a]	0.48±0.15[b]
	MPCPs-G	13.63±1.16[ab]	4.02±0.16[b]	0.84±0.05[a]	0.04±0.05[a]	0.33±0.00[a]	63.16±1.17[b]	14.93±0.09[a]	0.57±0.07[a]	1.87±0.10[b]	0.60±0.09[b]
	MPCPs-I	12.60±0.70[b]	7.33±0.29[a]	0.88±0.05[a]	0.09±0.03[a]	0.55±0.44[a]	59.30±1.70[c]	16.25±1.21[a]	0.59±0.02[a]	1.37±0.10[c]	1.04±0.11[a]

16 Each value is expressed as the mean ± SD (n = 3) of triplicate determinations. Means with different letters within a row are significantly

17 different ($p < 0.05$). Man: Mannose; Rib: Ribose; Rha: Rhamnose; GlcA: Glucuronic Acid; GalA: Galacturonic Acid; Glu: Glucose; Gal:

18 Galactose; Xyl: Xylose; Ara: Arabinose; Fuc: Fucose. Undigested, PCPs-S, PCPs-G and PCPs-I in PCPs represent undigested PCPs, saliva-

19 digested, gastric-digested, and intestinal-digested PCPs, respectively. Undigested, MPCPs-S, MPCPs-G and MPCPs-I in MPCPs represent

20 undigested MPCPs, saliva-digested, gastric-digested, and intestinal-digested MPCPs, respectively.

Table S3

Basic sequencing indexs and Alpha diversity of samples from different groups

Sample	Sobs	Ace	Chao	Coverage	Shannon	Simpson
OR	243.33 ± 1.15^a	267.65 ± 2.01^a	277.00 ± 12.19^a	0.999419667	3.78 ± 0.00^a	0.05 ± 0.05^c
BLK	212.67 ± 1.53^b	242.39 ± 2.19^b	253.28 ± 11.29^a	0.999229667	3.15 ± 0.44^b	0.09 ± 0.01^b
INL	141.33 ± 4.16^d	185.89 ± 18.50^c	168.68 ± 8.99^c	0.999225333	2.31 ± 0.05^d	0.20 ± 0.01^a
PCPs	158.67 ± 9.02^c	187.33 ± 5.28^c	181.91 ± 6.12^{bc}	0.999086333	2.73 ± 0.12^c	0.11 ± 0.01^b
MPCPs	156.33 ± 19.50^{cd}	194.81 ± 26.03^c	204.32 ± 33.67^b	0.998914667	2.68 ± 0.23^c	0.11 ± 0.02^b

Each value is expressed as the mean $\pm$ SD (n = 3) of triplicate determinations. Means with different letters within a row are significantly different ($p < 0.05$).

Table S4

The concentration of short chain fatty (SCFAs) during fermentation (mM)

Groups	Time	Acetic acid	Propionic acid	i-Butyric acid	n-Butyric acid	i-Valeric acid	n-Valeric acid	Total
BLK	0	0.41±0.02[c]	ND	ND	ND	ND	0.14±0.00[c]	0.54±0.02[d]
	6	0.70±0.18[b]	0.34±0.15[b]	0.14±0.01[bc]	0.17±0.01[b]	ND	ND	1.36±0.06[c]
	12	0.69±0.12[b]	0.52±0.03[a]	0.23±0.05[b]	0.17±0.01[b]	0.08±0.00[a]	0.19±0.00[b]	1.89±0.10[b]
	24	1.17±0.09[a]	0.47±0.06[ab]	0.54±0.21[a]	0.34±0.07[a]	0.11±0.03[a]	0.85±0.05[a]	3.47±0.37[a]
INL	0	1.67±0.23[d]	ND	ND	ND	ND	ND	1.67±0.23[d]
	6	3.05±0.21[c]	1.16±0.04[c]	0.86±0.08[c]	2.51±0.11[c]	0.53±0.02[b]	0.42±0.11[c]	8.54±0.35[c]
	12	6.37±0.71[b]	2.37±0.12[b]	1.08±0.11[b]	3.27±0.23[b]	0.78±0.04[b]	1.39±0.05[b]	15.27±0.66[b]
	24	10.73±0.66[a]	3.94±0.14[a]	1.79±0.14[a]	3.88±0.14[a]	1.60±0.35[a]	2.47±0.28[a]	24.41±1.29[a]
PCPs	0	1.00±0.03[d]	ND	ND	ND	ND	0.25±0.02[d]	1.24±0.47[d]
	6	1.67±0.08[c]	0.43±0.23[c]	0.55±0.10[b]	1.92±0.03[b]	0.33±0.07[c]	0.39±0.03[c]	5.30±0.21[c]
	12	4.68±0.46[b]	1.70±0.09[b]	0.53±0.04[b]	2.26±0.58[ab]	0.54±0.11[b]	0.89±0.06[b]	10.61±0.45[b]
	24	7.20±0.34[a]	3.26±0.21[a]	1.32±0.38[a]	2.52±0.20[a]	0.87±0.01[a]	2.02±0.12[a]	17.20±0.34[a]
MPCPs	0	1.06±0.04[d]	ND	ND	ND	ND	0.20±0.03[d]	1.26±0.05[d]
	6	1.50±0.05[c]	0.47±0.03[c]	0.55±0.06[c]	1.49±0.07[c]	0.55±0.21[b]	0.45±0.06[c]	5.01±0.29[c]
	12	4.20±0.41[b]	1.42±0.07[b]	1.09±0.07[a]	1.86±0.12[b]	0.71±0.05[b]	0.84±0.07[b]	10.12±0.55[b]
	24	6.80±0.10[a]	4.84±0.56[a]	1.30±0.27[a]	2.15±0.13[a]	0.92±0.02[a]	2.16±0.01[a]	18.18±0.50[a]

Each value is expressed as the mean ± SD (n = 3) of triplicate determinations. Means with different letters within a row are significantly different ($p < 0.05$).