

## Supplementary materials

Table S1. Optimal conditions obtained from the analysis of orthogonal experiment  $L_9(3^3)$  based on different evaluation indexes.

Evaluation index	Range & Optimal Scheme	Factor A (Temperature)	Factor B (pH)	Factor C (Enzyme dosage)
Hydroxyl radical scavenging rate/%	R Optimal Scheme	3.28 $A_1$	4.99 $B_1$	5.38 $C_1$
DPPH radical scavenging rate/%	R Optimal Scheme	10.32 $A_1$	1.54 $B_1$	2.59 $C_3$
Reducing capacity	R Optimal Scheme	0.019 $A_3$	0.005 $B_3$	0.005 $C_3$
Total antioxidant capacity	R Optimal Scheme	0.003 $A_2$	0.004 $B_2$	0.002 $C_2$
Comprehensive score	R Optimal Scheme	3.40 $A_1$	1.61 $B_1$	1.18 $C_1$

Table S2. The factors and levels of orthogonal design.

Levels	Factors		
	Temperature (°C)	pH	Enzyme dosage (U/g)
1	30	4.4	250,000
2	40	5.0	300,000
3	50	5.6	350,000

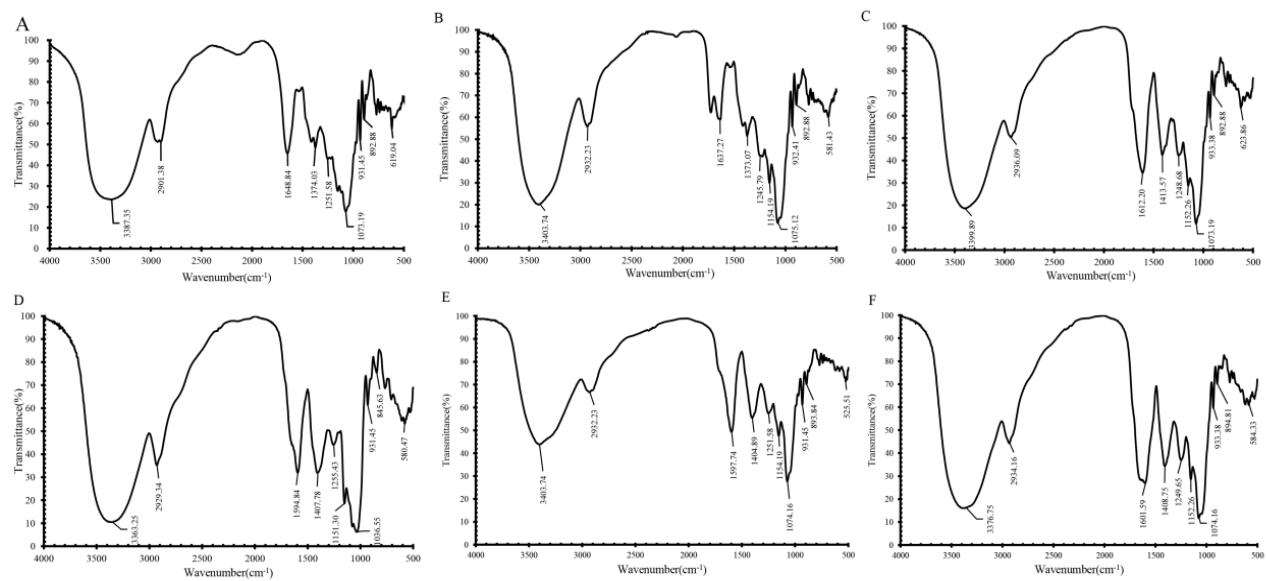


Figure S1 FTIR spectrum of GLP and its different enzymatic hydrolysis products: GLP(A), GPP(B), GGP(C), GCP(D), GXP(E), GDP(F).

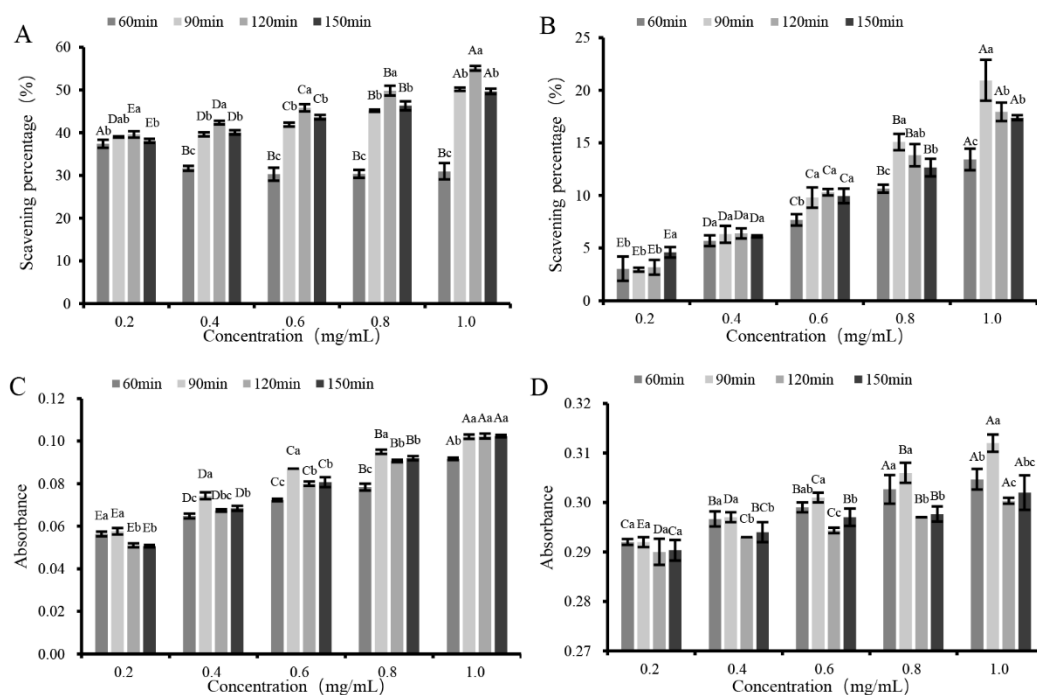


Figure S2 Effects of enzymolysis time on scavenging ability of hydroxyl radical (A), scavenging ability of DPPH radical (B), reducing capacity (C) and total antioxidant capacity (D) of GDP. Vertical bars represent means  $\pm$  SD ( $n = 3$ ). Different uppercase letters among different concentration of the same group indicate significant difference ( $p < 0.05$ ), and different lowercase letters among different groups of the same concentration indicate significant difference ( $p < 0.05$ ).

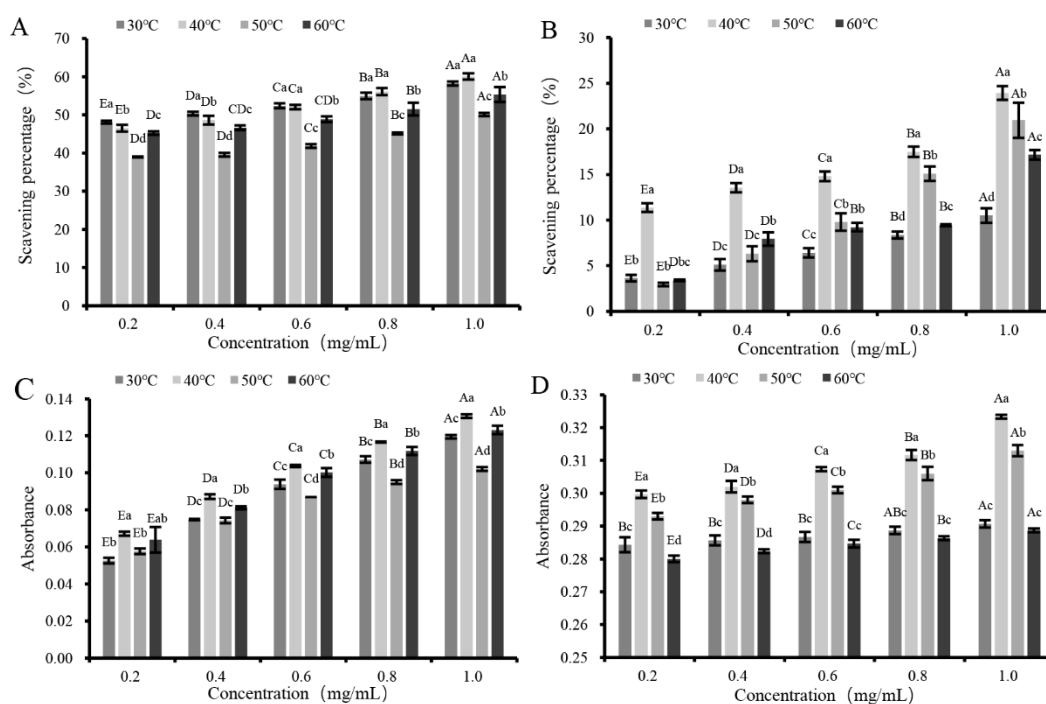


Figure S3 Effects of enzymolysis temperature on scavenging ability of hydroxyl radical (A), scavenging ability of DPPH radical (B), reducing capacity (C) and total antioxidant capacity (D) of GDP. Vertical bars represent means  $\pm$  SD ( $n = 3$ ). Different uppercase letters among different concentration of the same group indicate significant difference ( $p < 0.05$ ), and different lowercase letters among different groups of the same concentration indicate significant difference ( $p < 0.05$ ).

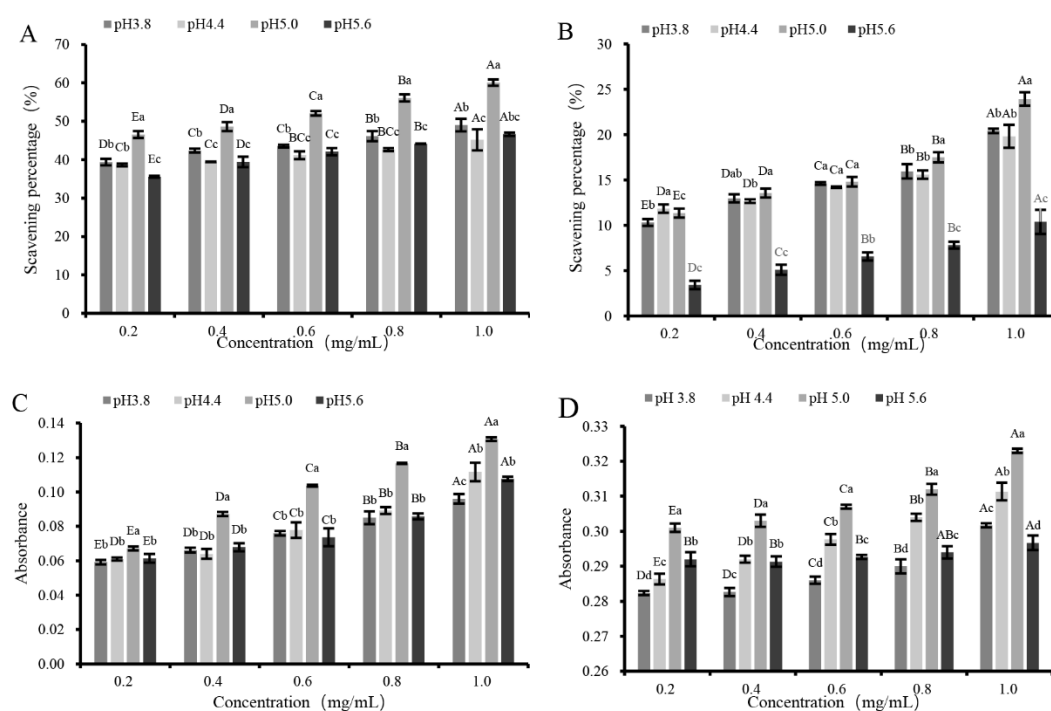


Figure S4 Effects of enzymolysis pH on scavenging ability of hydroxyl radical (A), scavenging ability of DPPH radical (B), reducing capacity (C) and total antioxidant capacity (D) of GDP. Vertical bars represent means  $\pm$  SD ( $n = 3$ ). Different uppercase letters among different concentration of the same group indicate significant difference ( $p < 0.05$ ), and different lowercase letters among different groups of the same concentration indicate significant difference ( $p < 0.05$ ).

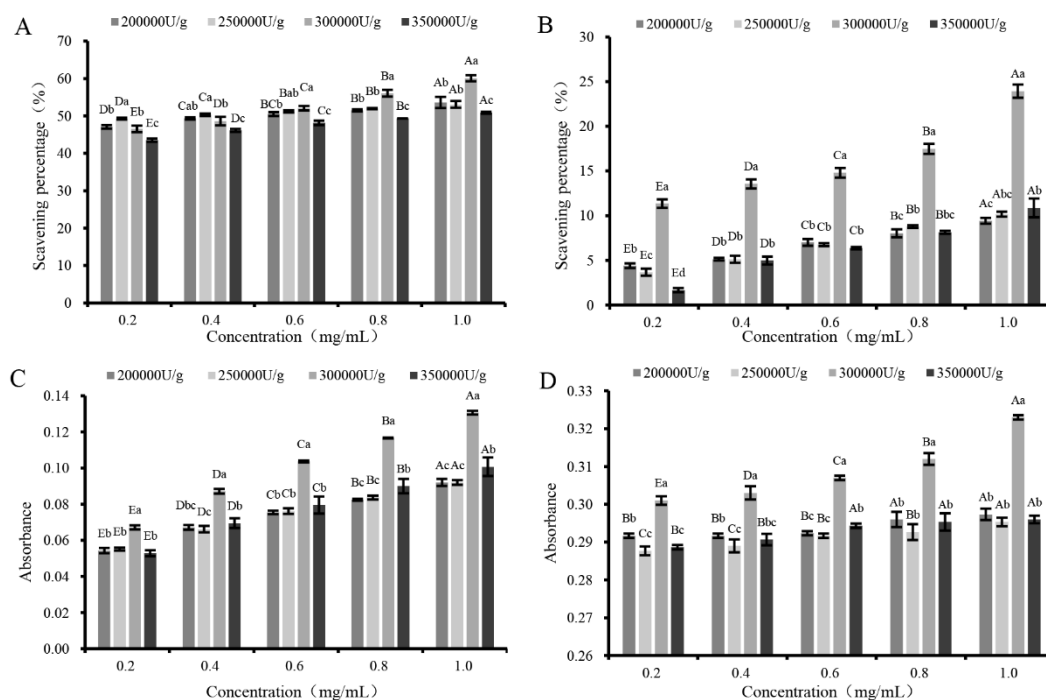


Figure S5 Effects of enzyme dosage on scavenging ability of hydroxyl radical (A), scavenging ability of DPPH radical (B), reducing capacity (C) and total antioxidant capacity (D) of GDP. Vertical bars represent means  $\pm$  SD ( $n = 3$ ). Different uppercase letters among different concentration of the same group indicate significant difference ( $p < 0.05$ ), and different lowercase letters among different groups of the same concentration indicate significant difference ( $p < 0.05$ ).