Supplementary information

1. The preparation method of D-SPP

Dried powder of *Sargassum pallidum* was refluxed with 95% ethanol twice at 70 °C for 3 h to remove liposoluble compounds and impurities. The dried residue was extracted with distilled water with a solid to liquid ratio of 1:30 (w/v) at 90 °C for 3 h. After twice extraction, the combined extracts were concentrated, which was then subjected to deproteinization and decolorization according to the previous methods. Then, the resulting solution was precipitated (12 h, 4 °C) by adding dehydrated ethanol to a final concentration of 80% (v/v). The precipitate was centrifuged, collected and lyophilized to obtain crude polysaccharides (SPP). Previous reported method was utilized to prepare partially degraded *S. pallidum* polysaccharides (D-SPP). Namely, SPP aqueous solution was treated with an ultrasonic homogenizer (S-jia Lab Equipment Co., Ltd. Ningbo, China) at 500 W power for 1 h, then the solution was concentrated and lyophilized to obtained D-SPP powder. The molecule weight, chemical components and monosaccharide composition of D-SPP are listed in **Table S1** and **Fig. S1**.

Table S1 Chemical composition and structural properties of D-SPP

Items	D-SPP
Molecule weight (Da)	5.10×10^5
Chemical composition (%, g/g)	
Total carbohydrates	68.72 ±3.21%
Proteins	6.54 ± 0.61%
Monosaccharide (molar %)	
Fucose	18.20±0.73%
Arabinose	3.88±0.42%
Galactose	25.51±1.18%
Glucose	4.14±0.14%
Xylose	5.67±0.17%
Mannose	0.80±0.10%
Galacturonic acid	29.94±1.47%
Glucuronic acid	8.87±0.98%

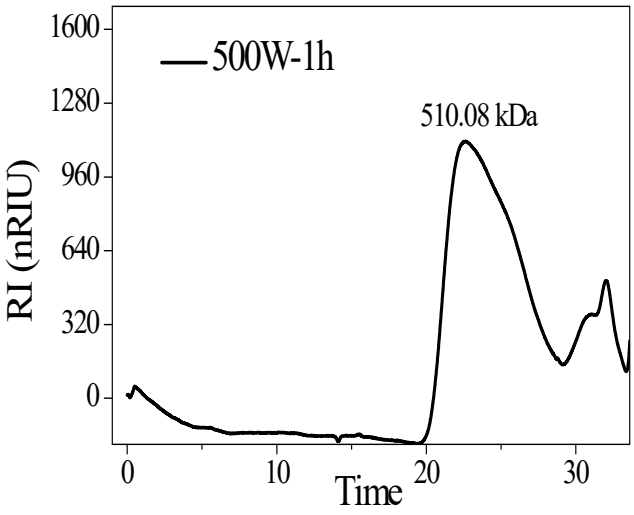

Fig. S1 The HPGPC profile of molecular weight distribution of D-SPP

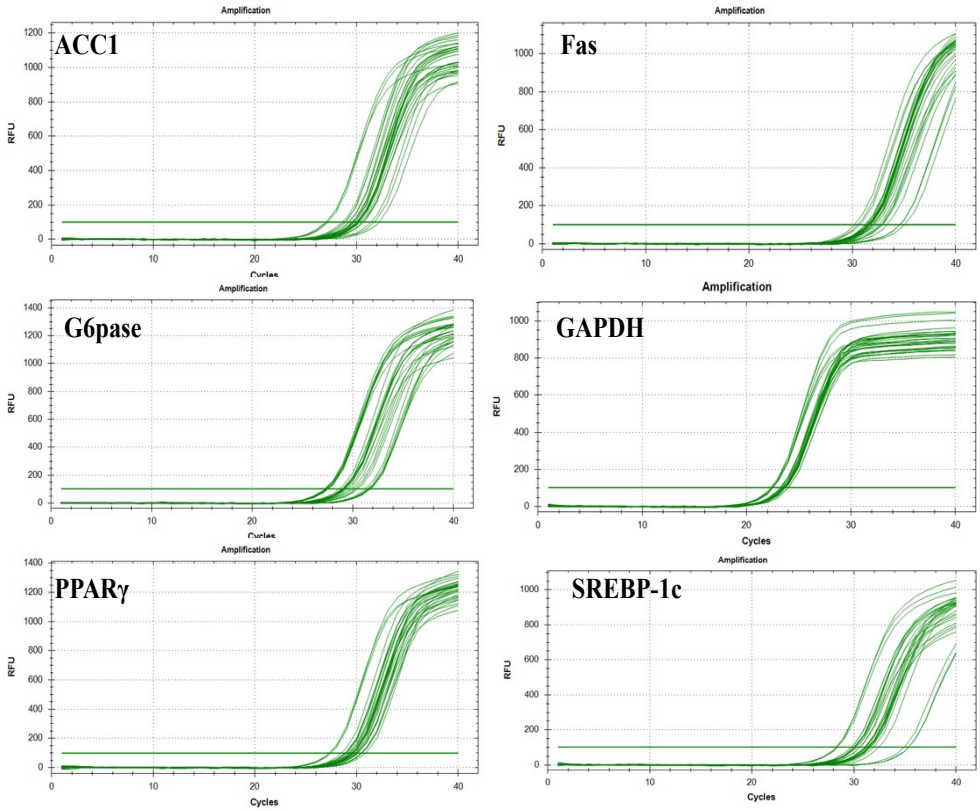

Fig. S2 Amplification curves of cDNA of lipogenesis from liver

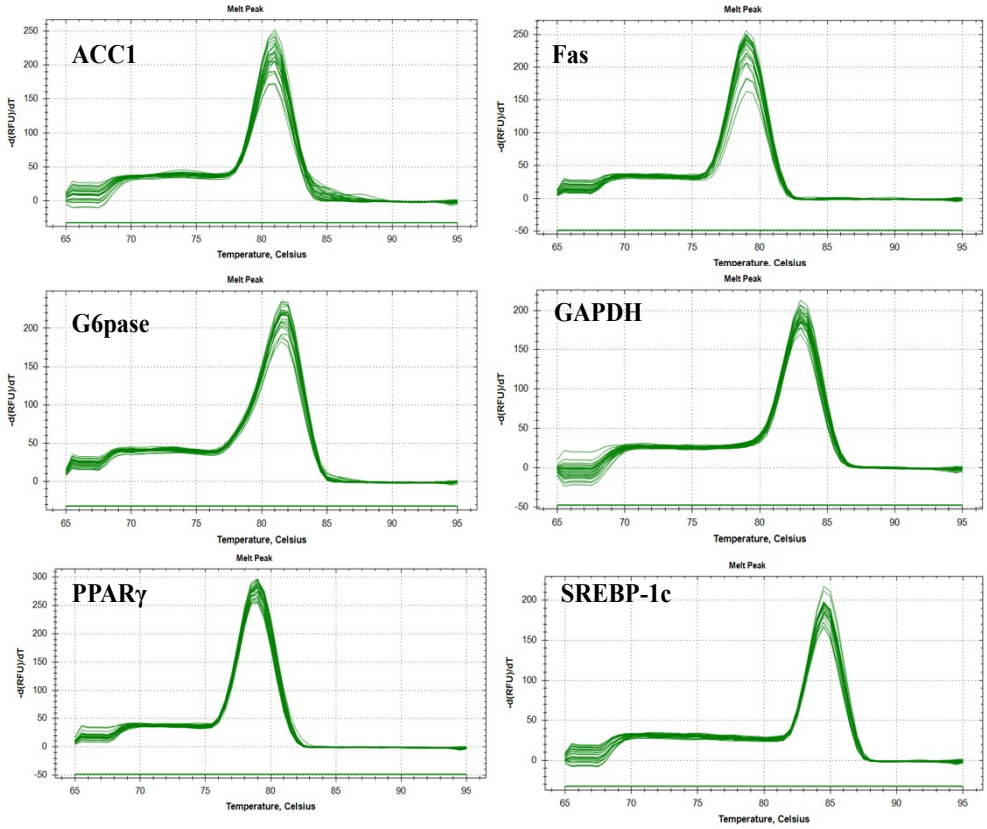

Fig. S3 Dissolution curves of cDNA of lipogenesis from liver

Table S2 Primer Sequences for Quantitative RT-PCR

Genes			Fragment length	A t (°C)
GAPDH	sense primer antisense primer	CCTCGTCCCGTAGACAAAATG TGAGGTCAATGAAGGGGTCGT	133	60
PPARγ	sense primer antisense primer	GACCACTCGCATTCCTTTGACA ATCGCACTTTGGTATTCTTGGA	155	60
FAS	sense primer antisense primer	TAGAACCTCCAGTCGTGAAACCA ATCTCATCTATCTTGCCCTCCTTG	150	60
ACC1	sense primer antisense primer	GCTAACCCAACTCAGCAAGACC CACCTGGTTGCTGTGGTAAAAA	238	60
SREBP-1c	sense primer antisense primer	GAAACCCGAAGTGGTGGAGAC TGGGCTTTGACCTGGCTATC	159	60
G6pase	sense primer	ACACCGACTACTACAGCAACAGC	208	60

antisense primer	AATCCCAACCACAAGATGACG