

Table S1: The 39 candidate compounds from *S. platensis* and its ADME screening information

No.	Compound name	mol MW	donorHB	acctpHB	QPlogP	OB (%)
1	1-palmitoyl-sn-glycerol 3-phosphate	408.487	3	8.7	4.225	57.545
2	2-Hydroxyglutaric acid	148.115	3	5.7	-0.386	32.698
3	3-Hydroxybutyrate	104.105	1	2.7	0.799	67.443
5	Apigenin.	270.241	6	3.75	1.628	73.306
6	Caffeoylglycerol	254.239	6	7.6	-0.54	50.046
7	Carnosic acid.	332.439	6	3.5	3.838	92.013
8	Catechin	290.272	6	5.45	0.443	60.083
9	Dihydroxypalmitic acid	288.426	6	4.4	3.771	79.28
10	Eicosapentaenoic acid	302.456	2	2	5.757	95.438
11	Ellagic acid	302.197	6	8	-1.294	35.459
12	Glycerol	92.094	6	5.1	-1.155	66.682
13	Hydroxydecanoic acid	188.266	6	3.7	2.015	75.558
14	Hydroxylauric acid	216.32	6	3.7	2.751	79.869
15	Hydroxylinoleic acid	296.449	4	3.7	4.211	92.888
16	Hydroxylinolenic acid	294.433	4	3.7	4.197	88.926
17	Hydroxy myristamide	285.469	6	4.2	3.8	100
18	Nonadecenoic acid	295.373	6	2.7	4.07	88.201

19	Hydroxypalmitic acid	272.427	6	3.7	4.256	88.722
20	Lauramide	199.336	6	2.5	2.215	86.452
21	Linoleic acid methyl ester	294.476	4	2	5.849	100
22	Linolenic acid.	278.434	4	2	5.236	87.243
23	Malic acid	134.088	6	4.7	-0.457	33.288
24	Methyladenosine	281.271	6	9.85	-1.207	49.34
25	Myristamide	227.389	6	2.5	2.979	90.922
26	Oleanonic acid	454.692	3	4	4.304	95.03
27	Oleic acid	282.465	4	2	5.982	91.614
28	p-Hydroxybenzoic acid	138.123	6	2.75	0.578	64.071
29	Pantothenic acid	219.237	6	6.9	-0.567	42.672
30	Phenylpyruvic acid	164.16	6	4	1.392	71.533
31	Phloroglucinol.	126.112	6	2.25	-0.02	70.516
32	Quercetin	302.24	6	5.25	0.356	52.327
33	Quercetin dimethylether	330.293	6	5.25	2.112	81.762
34	Rosmarinic acid	360.32	6	7	1.183	38.115
35	Stearidonic acid	276.418	4	2	3.056	88.19
36	Succinic acid	118.089	6	4	-0.576	37.281
37	3,4,5,7-Tetrahydroxyisoflavanone	288.175	3	4.25	0.974	76.637

38	Trimethyl citrate	234.205	6	5.75	0.715	78.924
39	Valine	117.147	6	3	-1.735	43.647

***The acceptable ADME values are molecular weight (MW)≤500, hydrogen bond acceptors (Hacc≤10), hydrogen bond donors (Hdon ≤5), and octanol-water partition coefficient lesser than five (LogP≤5).**

***Favorable oral bioavailability (OB) score ≥ 30%.**

Table S2: Potential protein targets of *S. platensis* derived constituents

Uniport ID	Short name of protein	Full name of protein
P03372	ESR1	Estrogen receptor
P35968	KDR	Vascular endothelial growth factor receptor 2
Q86WX3	SIRT1	Active regulator of SIRT1
P10721	KIT	Mast/stem cell growth factor receptor Kit
P43116	PTGER2	Prostaglandin E2 receptor EP2 subtype
P08581	MET	Hepatocyte growth factor receptor
P40763	STAT3	Signal transducer and activator of transcription 3
P45452	MMP13	Collagenase 3
P11802	CDK4	Cyclin-dependent kinase 4
P08069	IGF1R	Insulin-like growth factor 1 receptor

P61073	CXCR4	C-X-C chemokine receptor type 4
Q92731	ESR2	Estrogen receptor beta
O14746	TERT	Telomerase reverse transcriptase
P10415	BCL2	Apoptosis regulator Bcl-2
P68400	CSNK2A1	Casein kinase II subunit alpha
P00533	EGFR	Epidermal growth factor receptor
P48736	PIK3CG	Phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic subunit gamma isoform
P11309	PIM1	Serine/threonine-protein kinase pim-1
Q9UM73	ALK	ALK tyrosine kinase receptor
P43405	SYK	Tyrosine-protein kinase SYK
P01033	MMP3	Metalloproteinase inhibitor 3
P53350	PLK1	Serine/threonine-protein kinase PLK1
P41597	CCR2	C-C chemokine receptor type 2
P29350	PTPN6	Tyrosine-protein phosphatase non-receptor type 6
Q03181	PPARD	Peroxisome proliferator-activated receptor delta
Q13547	HDAC1	Histone deacetylase 1
Q07820	MCL1	Induced myeloid leukemia cell differentiation protein Mcl-1

P11309	PIM1	Serine/threonine-protein kinase pim-1
P15056	BRAF	Serine/threonine-protein kinase B-raf
P42574	CASP3	Caspase-3
P55212	CASP6	Caspase-6
O60674	JAK2	Tyrosine-protein kinase JAK2
Q92932	PTPN2	Receptor-type tyrosine-protein phosphatase N2
P06746	POLB	DNA polymerase beta
O96020	CCNE2	G1/S-specific cyclin-E2
P17252	PRKCA	Protein kinase C alpha type
P01584	IL1B	Interleukin-1 beta
O75955	FLT1	Flotillin-1
P00519	ABL1	Tyrosine-protein kinase ABL1
P51681	CCR5	C-C chemokine receptor type 5
P42345	MTOR	Serine/threonine-protein kinase mTOR
Q8WWL7	CCNB3	G2/mitotic-specific cyclin-B3
P06241	FYN	Tyrosine-protein kinase Fyn
P25024	CXCR1	C-X-C chemokine receptor type 1

Q92843	BCL2L2	Bcl-2-like protein 2
P06239	LCK	Tyrosine-protein kinase Lck
P14780	MMP9	Matrix metalloproteinase-9
O23507	MMP1	Matrix metalloproteinase-1
P08253	MMP2	Matrix metalloproteinase-2
P14174	MIF	Macrophage migration inhibitory factor
P23219	TYR	Tyrosinase
P09417	PTGS2	Prostaglandin G/H synthase 2
P31749	AKT1	RAC-alpha serine/threonine-protein kinase
P12931	SRC	Proto-oncogene tyrosine-protein kinase Src
Q9NRD5	PRKCA	PRKCA-binding protein
P15692	VEGFA	Vascular endothelial growth factor A
P37231	PPARG	Peroxisome proliferator-activated receptor gamma
O14788	TNF	Tumor necrosis factor
P60568	IL2	Interleukin-2
P04049	RAF1	RAF proto-oncogene serine/threonine-protein kinase
Q16548	BCL2A1	Bcl-2-related protein A1

P07333	CSF1R	Macrophage colony-stimulating factor 1 receptor
P52333	JAK3	Tyrosine-protein kinase JAK3
P31751	AKT2	RAC-beta serine/threonine-protein kinase
P45452	MMP13	Collagenase 3
P22894	MMP8	Neutrophil collagenase
P50281	MMP14	Matrix metalloproteinase-14
P14780	MMP9	Matrix metalloproteinase-9
P23458	JAK1	Tyrosine-protein kinase JAK1
O60603	TLR2	Toll-like receptor 2
O60674	JAK2	Tyrosine-protein kinase JAK2
P45984	MAPK9	Mitogen-activated protein kinase 9
Q16539	MAPK14	Mitogen-activated protein kinase 14
Q06187	BTK	Tyrosine-protein kinase BTK
P28482	MAPK1	Mitogen-activated protein kinase 1

P05231	IL6	Interleukin-6
P32246	CCR1	C-C chemokine receptor type 1
P51686	CCR9	C-C chemokine receptor type 9
P25025	CXCR2	C-X-C chemokine receptor type 2

Table S3: KEGG pathway analysis of potential target genes functions

Pathway ID	Pathway description	Observed gene count	false discovery rate	Matching proteins in pathway
hsa05200	Pathways in cancer	30	3.50E-22	MMP2,PTGER2,CDK4,STAT3,EGFR,CSF1R,KIT,TERT,CASP3,MET, MMP1,PTK2,ESR2,MTOR,PTGS2, MMP9,ABL1,PIM1,HDAC1,JAK2,ALK,BCL2,IL6,CXCR4,ESR1,BRAF,CCNE2,JAK3,AKT1,IGF1R
hsa05205	Proteoglycans in cancer	18	5.38E-16	DCN,MMP2,TLR2,KDR,STAT3,EGFR,CASP3,MET,PTK2,MTOR,MMP9,SRC,PTPN6, TNF,ESR1,BRAF,AKT1,IGF1R
hsa01522	Endocrine resistance	14	6.25E-15	BIK,MMP2,CDK4,EGFR,PTK2,ESR2,MTOR,MMP9,SRC,BCL2, ESR1,BRAF,AKT1,IGF1R
hsa05206	MicroRNAs in cancer	16	7.13E-15	SIRT1,BCL2L2,STAT3,EGFR,CASP3,MET,DNMT3B,MTOR,PTGS2, MCL1,MMP9, ABL1,PIM1,HDAC1,BCL2,CCNE2
hsa04151	PI3K-Akt signaling pathway	20	1.61E-14	CDK4,TLR2,KDR,EGFR,FLT1,CSF1R,KIT,MET,PTK2,MTOR,MCL1, SYK,JAK2,

				BCL2,IL6,PIK3CG,CCNE2,JAK3,AKT1,IGF1R
hsa01521	EGFR tyrosine kinase inhibitor resistance	12	3.14E-13	KDR,STAT3,EGFR,MET,MTOR,SRC,JAK2,BCL2,IL6,BRAF,AKT1,IGF1R
hsa04062	Chemokine signaling pathway	14	1.42E-11	STAT3,CCR2,CCR5,CXCR1,CCR1,PTK2,CCR9,SRC,JAK2,CXCR4,BRAF,PIK3CG,JAK3,AKT1
hsa05167	Apoptosis	14	1.42E-11	TNFRSF1A,CDK4,STAT3,CCR5,CCR1,CASP3,MTOR,PTGS2,SRC,SYK,JAK2,IL6,PIK3CG,AKT1
hsa05235	PD-L1 expression and PD-1 checkpoint pathway in cancer	11	2.50E-11	CSNK2A1,TLR2,STAT3,EGFR,MTOR,JAK2,ALK,PTPN6,AKT1,LCK
hsa04933	AGE-RAGE signaling pathway in diabetic complications	11	5.57E-11	MMP2,CDK4,IL1B,STAT3,CASP3,PIM1,JAK2,BCL2,IL6,TNF,AKT1
hsa04630	JAK-STAT signaling pathway	12	4.33E-10	STAT3,EGFR,PTPN2,MTOR,MCL1,PIM1,JAK2,BCL2,IL6,PTPN6,JAK3,AKT1
hsa05170	Small cell lung cancer (SCLC)	13	4.33E-10	CD4,TNFRSF1A,TLR2,CCR5,CASP3,PTK2,MTOR,CCNB3,CDK1,BCL2,CXCR4,TNF,AKT1
hsa04061	Viral protein interaction with cytokine and cytokine receptor	10	1.13E-09	TNFRSF1A,CSF1R,CCR2,CCR5,CXCR1,CCR1,CCR9,IL6,CXCR4,TNFRSF
hsa05162	MAPK signaling pathway	13	1.48E-09	CSNK2A1,CDK4,TLR2,IL1B,STAT3,CASP3,BCL2,IL6,CCNE2,JAK3,AKT1
hsa04510	Focal adhesion	12	2.95E-09	KDR,EGFR,FLT1,MET,PTK2,FYN,SRC,ILK,BCL2,BRAF,AKT1,IGF1R
hsa04015	Rap1 signaling pathway	12	3.90E-09	LCP2,KDR,EGFR,FLT1,CSF1R,KIT,MET,SRC,BRAF,AKT1,ADORA2A,IGF1R
hsa05166	Transcriptional misregulation in cancer	12	5.99E-09	CD4,TNFRSF1A,CDK4,MMP7,POLB,TERT,IL6,TNF,CCNE2,JAK3,AKT1,LCK
hsa04068	Viral carcinogenesis	10	8.45E-09	SIRT1,STAT3,EGFR,PLK1,S1PR1,CCNB3,IL6,BRAF,AKT1,IGF1R
hsa04657	IL-17 signaling pathway	9	1.01E-08	MMP13,IL1B,MMP3,CASP3,MMP1,PTGS2,MMP9,IL6,TNF
hsa05418	NF-kappa B signaling pathway	10	1.01E-08	TNFRSF1A,MMP2,IL1B,KDR,PTK2,MMP9,SRC,BCL2,TNF,AKT1
hsa05203	FoxO signaling pathway	11	1.52E-08	CDK4,STAT3,POLB,CCR5,CASP3,HDAC1,SRC,SYK,CDK1,CCNE2,JAK3
hsa04064	Fluid shear stress and atherosclerosis	9	1.93E-08	TNFRSF1A,CSNK2A1,IL1B,BCL2A1,PTGS2,SYK,BCL2,TNF,LCK

hsa05221	Acute myeloid leukemia	8	1.93E-08	STAT3,BCL2A1,CSF1R,KIT,MTOR,PIM1,BRAF,AKT1
hsa04668	TNF signaling pathway	9	3.68E-08	TNFRSF1A,IL1B,MMP3,CASP3,PTGS2,MMP9,IL6,TNF,AKT1
hsa05202	Human T-cell leukemia virus 1 infection	10	8.36E-08	BCL2A1,FLT1,CSF1R,MMP3,MET,PTK2,MMP9,HDAC1,IL6,IGF1R
hsa04210	Kaposi sarcoma-associated herpesvirus infection	8	1.49E-06	TNFRSF1A,CASP6,BCL2A1,CASP3,MCL1,BCL2,TNF,AKT1
hsa05225	Human immunodeficiency virus 1 infection	8	1.49E-06	CDK4,EGFR,TERT,MET,MTOR,BRAF,AKT1,IGF1R
hsa04620	Toll-like receptor signaling pathway	5	4.20E-04	TLR2,IL1B,IL6,TNF,AKT1
hsa04140	Autophagy	4	0.0092	MTOR,BCL2,AKT1,IGF1R
hsa05231	Choline metabolism in cancer	3	0.0256	EGFR,MTOR,AKT1

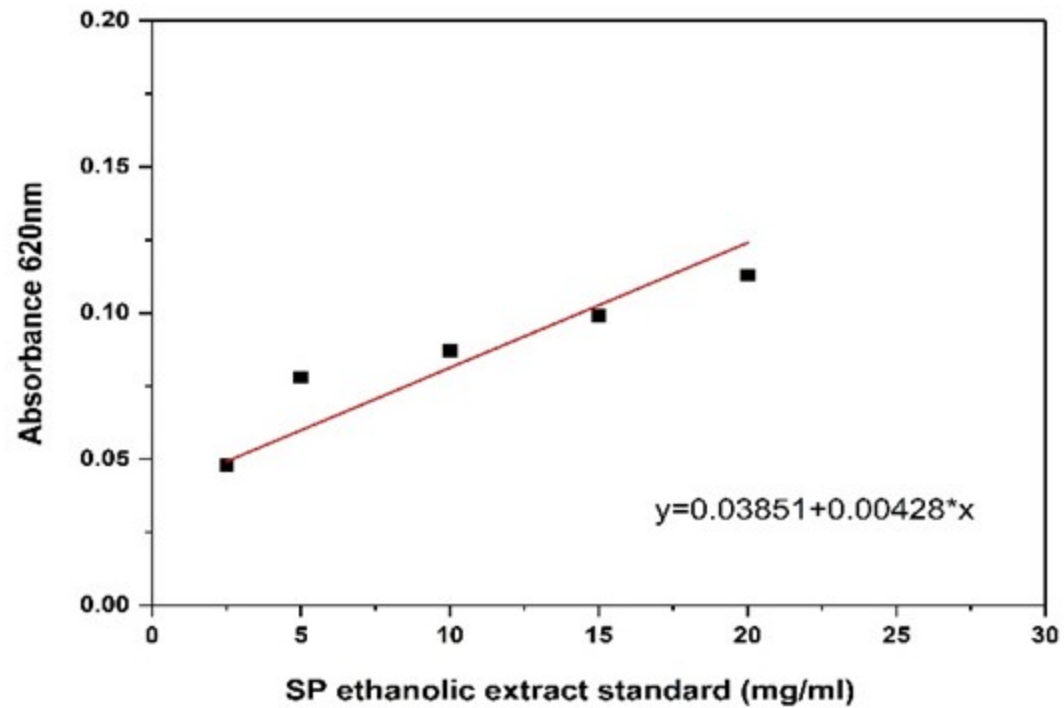
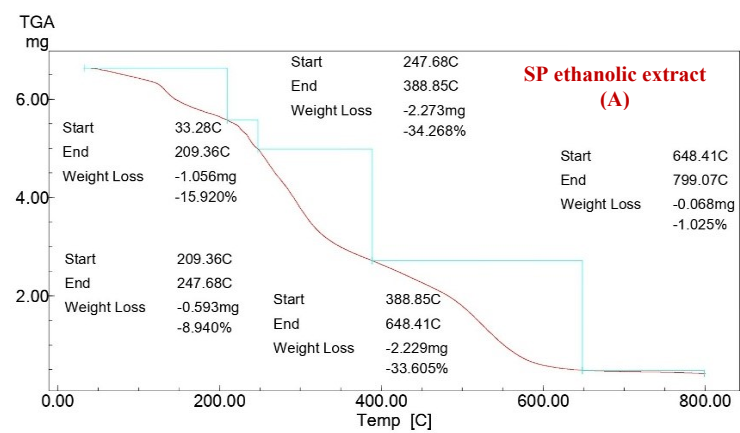
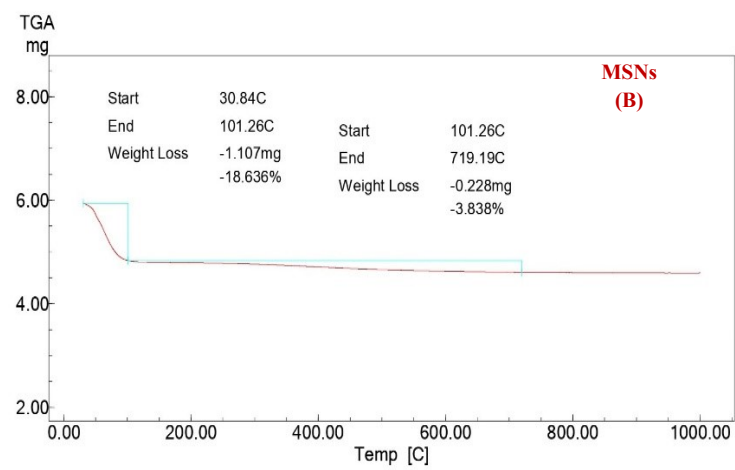


Figure S1: *Spirulina platensis* ethanolic extract standard curve was obtained by measuring the absorbance of the marker phycocyanin at 620 nm.





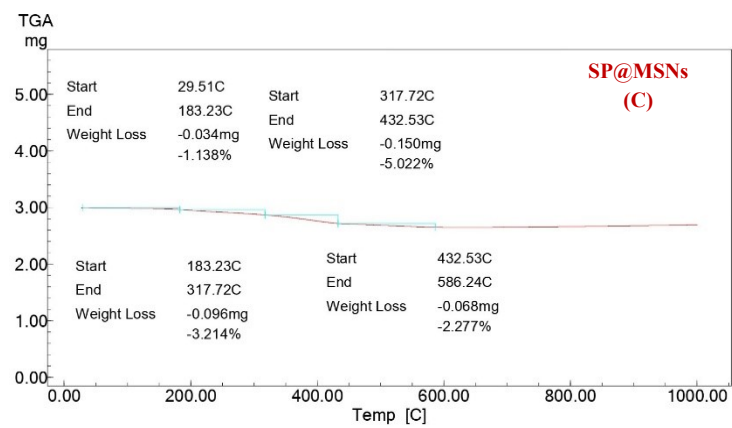


Figure S2: TGA analysis of Free SP particles (A), MSNs (B), and SP@MSNs (C).

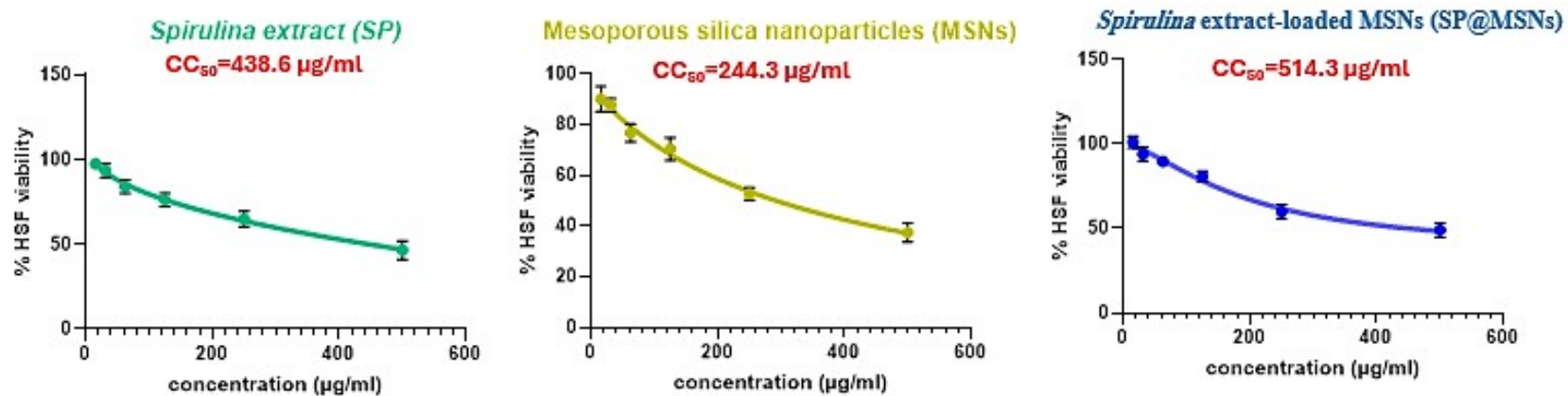


Figure S3: The results of cytotoxicity screening of *S. platensis*, MSNs, and SP@MSNs against HSF normal cells expressed Cytotoxic Concentration 50% (CC₅₀)

